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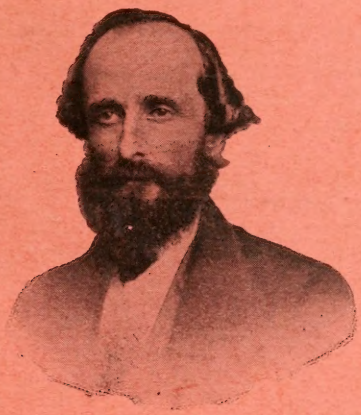

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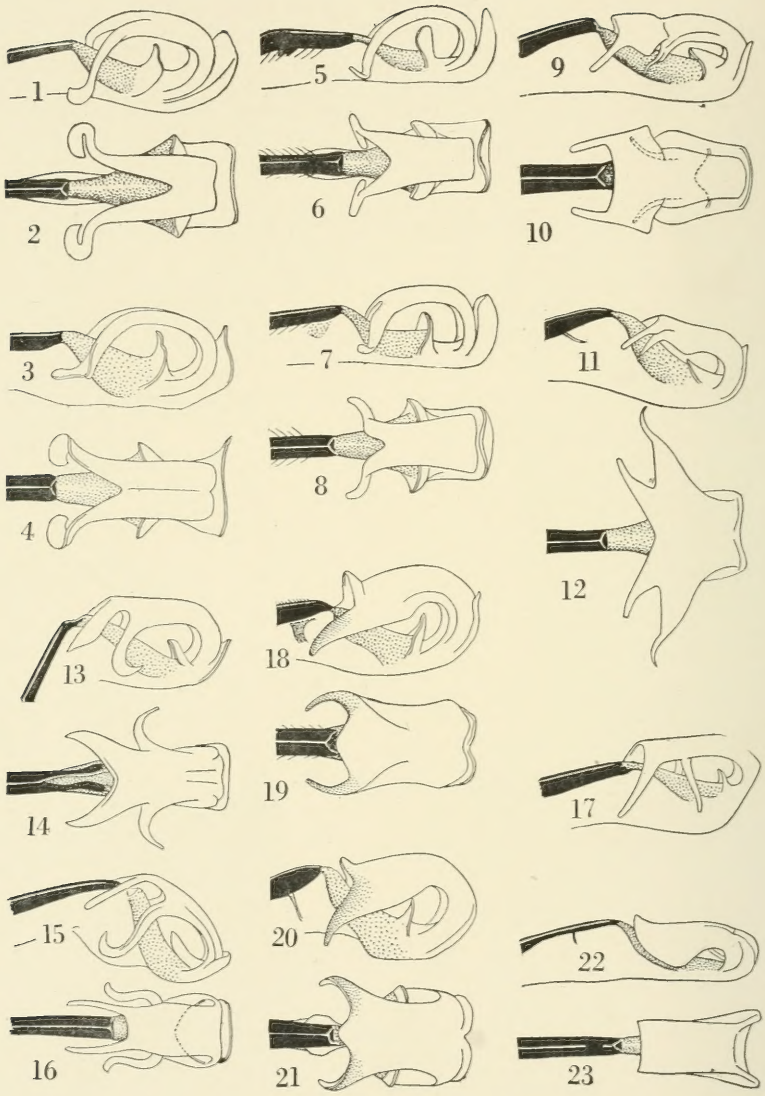

PENES, LEGION PROTONEURA (ZYGOPTERA, ODONATA).—KENNEDY.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

VOL. XXVIII. JULY, 1917. No. 7.

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Notes on the Penes of Zygoptera (Odonata).

No. 3. The Penes in Neoneura and Related Genera.

By CLARENCE HAMILTON KENNEDY, Cornell University, Ithaca, New York.

(Plates XXI-XXIII.)

In the first* of this series of articles was shown a series of penes in the genus *Acanthagrion,* whose divergent characters showed but little generic cohesion, a series with such abrupt changes in form from species to species that their characters could not be used in defining generic limits though they were exceptionally valuable in differentiating species.

In the second paper† was shown a series of penes in the Hawaiian genus *Megalagrion,* in which, though the genus included forms of diverse venation, size and body structure, the penes ran so close to each other in structure that the entire series of over twenty could not be divided into groups and

* Ent. News, xxvii, pp. 325-330, pl. XVIII, July, 1916.

† Ibid, xxviii, pp. 9-14, pls. II, III, Jan., 1917.

the penis could not be used as a specific character because of the lack of sufficient specific differences.

The present paper deals with a third condition, one that can be said to be intermediate between the preceding. It deals with a group in which the penis is a good generic as well as a good specific differential. As in the second paper, this group was chosen because of its immediate availability through Mr. Williamson's review of the genus *Neoneura* and his recent work on related genera.* It is offered as a supplement to his delimitation of genera and species in this Legion.

As in venation, the penis in the Legion Protoneura is reduced to a comparatively simple form, though it is not as reduced as in the Legion Lestes. Notwithstanding this reduction, ample variety of form yet occurs for the distinction of genera and species. By referring to the description and text-figure in my first article (*loc. cit.*) it will be seen that the penis in this group approaches nearly to this simple, generalized form. In most genera of the Legion Protoneura the terminal fold is lacking, though even this occurs in the genera *Palaemnema* and *Platysticta,* while it appears in a less degree in *Disparoneura, Caconeura* and *Isosticta.*

In the first series of figures accompanying this article are shown the penes (as far as I have been able to obtain them) of the type species in the greater number of the genera now accredited to this Legion.† With each, where possible, is shown the penis of a second species in the same genus to show at a glance those characters common to the two (generic characters) and those characters peculiar to the individual (specific characters). In the second series of figures are shown the penes of the species of the genus *Neoneura.*

*Notes on Neotropical Dragonflies or Odonata, Proc. U. S. Nat. Mus., Vol. 48. May 12, 1915, pp. 616-636. A new Dragonfly genus of the Legion Protoneura. Ent. News, Vol. xxvii, pp. 30-33, Jan., 1916. The genus Neoneura. Trans. Amer. Ent. Soc., xliii, pp. 211-246, pls. ix-xix, 1917.

†I am indebted to Mr. Philip Munz, who is working out the venational problems in the Zygoptera, for his list of these genera.

In a review of the penes in the first series one can readily see that good generic as well as specific characters exist, a condition different from that which was found in *Acanthagrion* on the one hand and equally different from the opposite condition found in the penes of the Hawaiian Zygoptera. Also the penes in this group show certain characters in common which might induce one, not familiar with the penes of the other Zygoptera, to attempt a definition for the group. Unfortunately many parallelisms occur in the form of this organ in the various genera, so that in using the characters of the penis to untangle classification the form of the penis has always to be considered in conjunction with any and all other available characters.

Among the startling parallelisms is the resemblance between the penes of *Palaemnema* and *Bayadera* the latter of which is in the Agrionidae, [Calopterygidae] another family of the Zygoptera. Certain species in *Disparoneura* (not figured in this series) have penes almost identical with that of *Amphipteryx* and nearly every one of the other generic forms can be paralleled in the Legion Coenagrion. The forms illustrated here are given merely to show a series in which the penis can be used to aid in the definition of genera. In this series, however, the penes show two or possibly three lines of evolution, which on a more complete study of the genera involved may show groupings within the Legion. Mr. Williamson has even suggested that this Legion may be an unnatural group, being merely the association of those forms of reduced venation, which have developed independently in various other Legions. The evidence for and against this will be given in a later paper after a more thorough study of this group has been made.

The following notes point out what may be considered generic characters in the genera illustrated.*

Palaemnema paulina Drury, figs. 1-2, genotype. Both soft folds present. Segment 3 two-lobed, the tips flattened into incurved hooks.

* The arrangement of genera used by Kirby, Cat. Odonata, London, 1890, has been followed.

Platysticta maculata Selys, figs. 5-6, genotype. Similar to *Palaemnema,* but the tips of the lobes of segment 3 not widened and flattened.

Disparoneura glauca Burm., figs. 9-10, genotype. Both soft folds present, the terminal fold short. Segment 3 four-lobed, the basal lobes spine-like.

Caconeura dorsalis Selys, figs. 13-14, genotype. Both soft folds present, the terminal fold short. Segment 3 four-lobed, the basal lobes long and flat.

Nososticta solida Selys, fig. 17, genotype. No terminal fold. Segment 3 four-lobed, the basal lobes narrow, perpendicular to the segment.

Isosticta simplex Martin, figs. 18-19. Both folds present, the terminal fold short. Segment 3 with two terminal lobes whose apices are chitinized and turned dorsad.

Neosticta canescens Tillyard, figs. 20-21, genotype. Segment 2 broader than segment 3, otherwise as in *Isosticta.*

Idioneura ancilla Selys, figs. 22-23, genotype. No terminal fold. Third segment simple, tips rounded. The internal fold reduced to a soft spine.

Microneura caligata Selys, figs. 24-25, genotype. No terminal fold. Segment 3 entire, in cross section deeply V-shaped.

Protoneura capillaris Ramb., fig. 26, genotype. Similar to penis in *Microneura,* but segment 3 with lateral apical lobes projecting caudad.

Epipleoneura lamina Williamson, fig. 29, genotype. Terminal fold bilobed, segment 3 with an apical notch.

Phasmoneura olmyra Williamson, figs. 32-33, genotype. Similar to the penis in *Microneura,* but segment 3 with an apical notch.

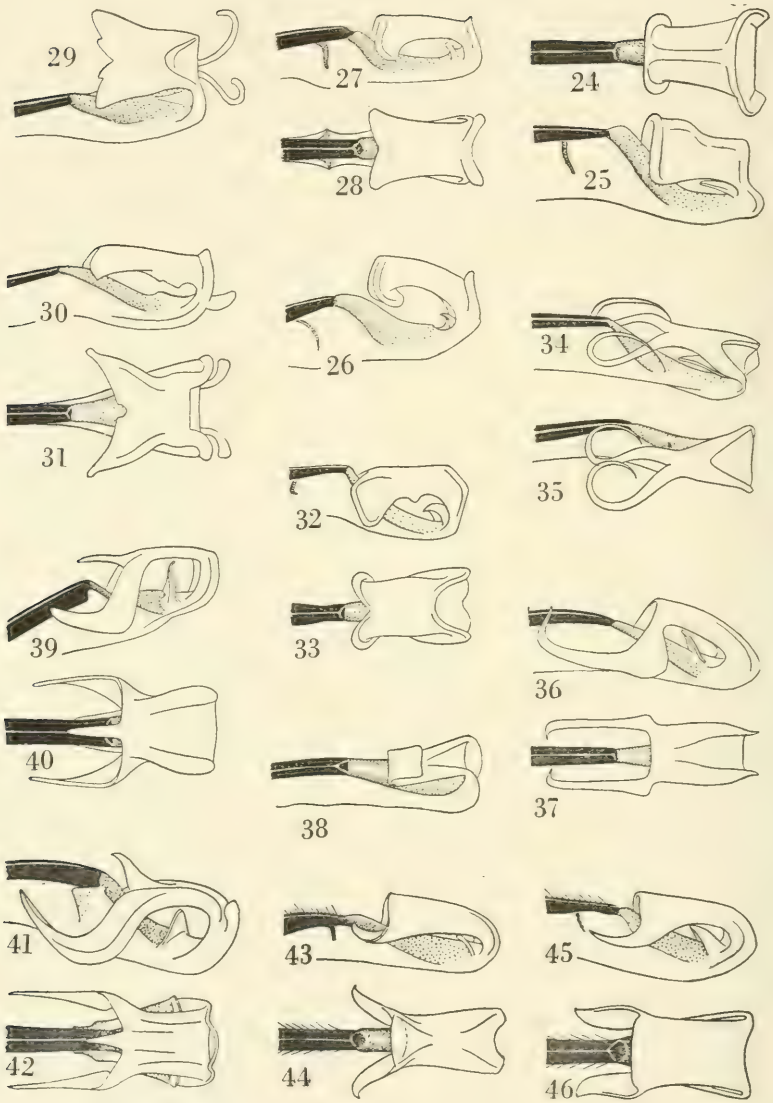
Psaironeura remissa Calvert, figs. 34-35, genotype. No terminal fold. Segment 3 divided apically into two attenuate lobes.

Epipotoneura nehalennia Williamson, fig. 38, genotype. No terminal lobe. Segment 3 with a square tip apparently folded back. (This was so minute I was not certain of the exact form of segment 3.)

Selysioneura cervicornu Förster, figs. 39-40, genotype. Terminal fold very short or wanting. Segment 3 trilobed.

Neoneura bilinearis Selys, figs. 43-44, genotype. Similar to *Protoneura,* but the lateral apical lobes pointing cephalad.

The second series of illustrations deals with the species in the genus *Neoneura.* In this genus the inner edges of the anterior lobes turn in. In *Neoneura rubriventris,* figs. 69-71, the apical lobes are reduced to mere rudiments. In *Neoneura mariana,* figs. 63-64, the terminal lobes are best developed. Usually they are pointed, but in *sylvatica* they have rounded tips. It is not necessary to go into detail concerning these as the illustrations show how a single type can appear variously modified in a series of congeneric species.



PENES OF NEONEURA (ZYGOPTERA, ODONATA).—KENNEDY.

In conclusion, while the penis in certain groups of Zygoptera has little value as a generic character, and in other groups has little value as a specific character, in this particular group of the Legion Protoneura it is of considerable assistance in defining both genera and species. As was stated at the beginning of this article, only a monographic study of the penis throughout the entire sub-order of Zygoptera can show what value to place on the penis in any group as a systematic help. In all the work this character appears to be suggestive rather than positive and final.

Explanation of Plates XXI-XXIII.

Drawings of penes in the Legion Protoneura, being lateral and ventral views of the last two segments.

Figs. 1-2, *Palaemnema paulina* Drury, genotype. El Fiscal, Guat., June 6, 1909, in coll. Williamson.

Figs. 3-4, *Palaemnema angelina* Selys; Atoyac, Vera Cruz, Mex. May, H. H. S., in coll. Calvert.

Figs. 5-6, *Platysticta maculata* Selys, genotype; Ceylon, in coll. Hagen, M. C. Z.

Figs. 7-8, *Platysticta tropica* Selys; Ceylon, in coll. Hagen, M. C. Z.

Figs. 9-10, *Disparoneura glauca* Burm., genotype; Cap[e] in coll. Hagen, M. C. Z.

Figs. 11-12, *Disparoneura westermanni* Selys; Nilgiris, in M. C. Z.

Figs. 13-14, *Caconeura dorsalis* Selys, genotype; Lohabu, N. Borneo, in coll. Williamson.

Figs. 15-16, *Caconeura insignis* Selys; Java, Tilg., in coll. Williamson.

Fig. 17, *Nosticta solida* Selys, genotype; Queensland, in coll. Williamson.

Figs. 18-19, *Isosticta simplex* Martin; Sydney, N. S. W., coll. by Tillyard, in coll. Kahl.

Figs. 20-21, *Neosticta canescens* Tillyd., genotype. Tabalam, N. S. W., cotype, in coll. Kahl.

Figs. 22-23, *Idioneura ancilla* Selys, genotype; Brazil, Winthem, in coll. Hagen, M. C. Z.

Figs. 24-25, *Microneura caligata* Selys, genotype; Cuba, 1864, in coll. Hagen, M. C. Z.

Fig. 26, *Protoneura capillaris* Ramb., genotype; Portland, Jamaica, in coll. Calvert.

Figs. 27-28, *Protoneura calverti* Williamson; Tumatumari, Brit. Guiana, in coll. Calvert.

Fig. 29, *Epipleoneura lamina* Williamson, genotype; Wismar, Brit. Guiana, in coll. Williamson.

Figs. 30-31, *Epipleoneura fuscaenea* Williamson; Wismar, Brit. Guiana, in coll. Williamson.

Figs. 32-33, *Phasmoneura olmyra* Williamson, genotype; Rockstone, Brit. Guiana, in coll. Williamson.

Figs. 34-35, *Psaironeura remissa* (Calvert), genotype; Puerto Barrios (?), Guat., in coll. Williamson.

Figs. 36-37, *Psaironeura cerasina* Williamson; Wismar, Brit. Guiana, in coll. Williamson. Type.

Fig. 38, *Epipotoneura nehalennia* Williamson, genotype; Potaro Landing, Brit. Guiana, in coll. Williamson. Type.

Figs. 39-40, *Selysioneura cervicornu* Förster, genotype; Gegagalu on Sattelberg, New Guinea, Carl Wahnes, in coll. Williamson.

Figs. 41-42, *Selysioneura cervicornu* Förster; Sattelberg, Carl W., in coll. Williamson.

Figs. 43-44, *Neoneura bilinearis* Selys, genotype; Wismar, Brit. Guiana, in coll. Williamson.

Figs. 45-46, *Neoneura carnatica* Selys; Cuba, Poey, 1864, in coll. Hagen, M. C. Z.

Figs. 47-48, *Neoneura aaroni* Calvert; Texas, in coll. Williamson.

Figs. 48-49, *Neoneura amelia* Calvert; Rio Liberia, Liberia, Costa Rica, in coll. Williamson.

Figs. 51-52, *Neoneura denticulata* Williamson, Iquitos, Peru, in coll. M. C. Z.

Figs. 53-54, *Neoneura esthera* Williamson; Diego-Martin Riv., Trinidad, in coll. Williamson.

Figs. 55-56, *Neoneura ethela* Williamson; Rio Grande do Sul, Brazil, in coll. Calvert (det. P. P. C. Ann. Car. Mus. VI, p. 212 as *rubriventris*).

Figs. 57-58, *Neoneura fulvicollis* Selys; Rio Cuyaba, Brazil (det. Calvert, Ann. Car. Mus. VI, p. 212), in coll. Carnegie Mus., Pittsburgh.

Figs. 59-60, *Neoneura joana* Williamson, Rockstone, Brit. Guiana, in coll. Williamson.

Figs. 61-62, *Neoneura maria* Scudd.; Cuba. Ch. Wright in coll. M. C. Z.

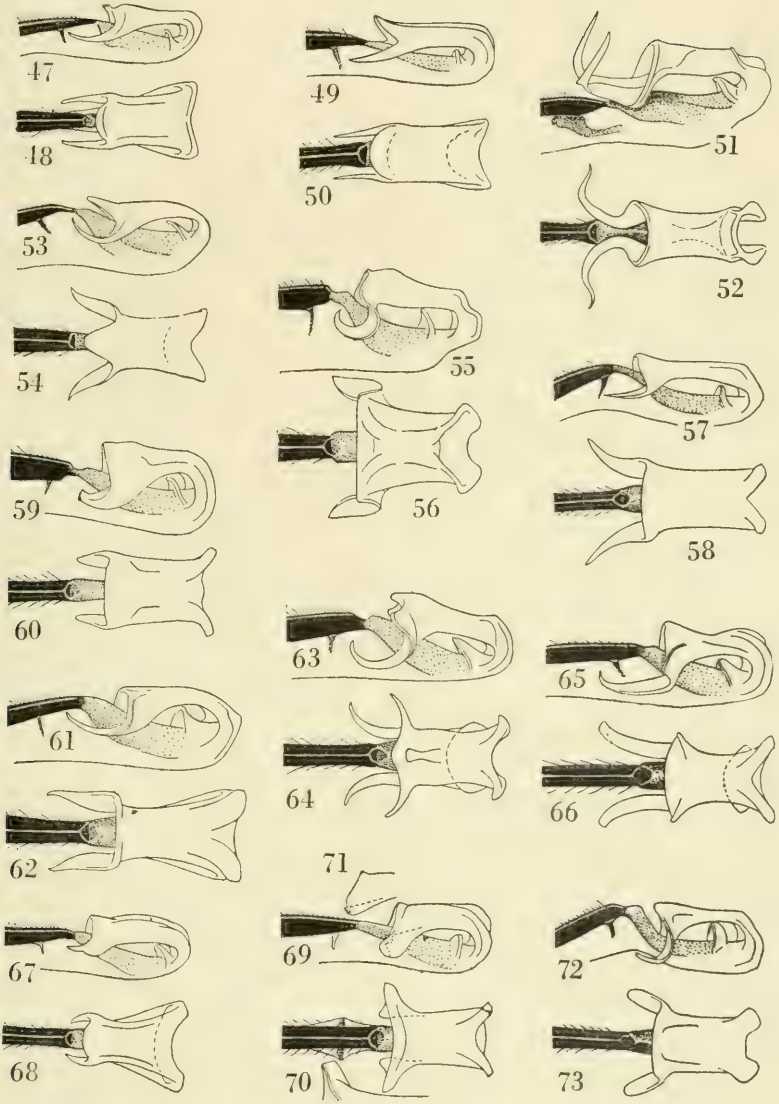
Figs. 63-64, *Neoneura mariana* Williamson; Tumatumari, Brit. Guiana, in coll. Williamson.

Figs. 65-66, *Neoneura myrthea* Williamson; Wismar, Brit. Guiana, in coll. Williamson.

Figs. 67-68, *Neoneura paya* Calvert; del Norte, Guat., in coll. Williamson.

Figs. 69-71, *Neoneura rubriventris* Selys; Tumatumari, Brit. Guiana, in coll. Williamson.

Figs. 72-73, *Neoneura sylvatica* Selys; Cachoeira, Brazil, in coll. Carnegie Mus.



PENES, LEGION PROTONEURA (ZYGOPTERA ODONATA).—KENNEDY.

Life History and Habits of the Margined Water Strider, Gerris marginatus Say (Hem., Het.).

By J. R. de la Torre Bueno, White Plains, New York.

This species, *Gerris marginatus,* Say 1832, *lacustris* Kirby 1837 (sec. Van Duzee, Ch. L.), is the common smaller *Gerris* spread over all the United States, a familiar form on ponds and in the bays of lakes. It has been recorded in Canada from British Columbia to Quebec, and in the United States from Oregon and California to Georgia and Texas, but twenty-three States are still to be heard from, including the greater part of the Mississippi Basin.

Gerris marginatus belongs in the subgenus *Gerris sensu strictu* (=*Limnotrechus*) which contains the smaller members. This subgenus, however, presents intergrading forms with subgenus *Aquarius* among the exotic species, *Gerris chilensis* Berg forming the passage. The character of the first joint of the antenna shorter than the second and third taken together, in connection with the smaller size, serves to separate *Gerris* from *Aquarius.* Two species of the subgenus in the Eastern States may be confused with it, namely, *Gerris buenoi* Kirkaldy and *Gerris canaliculatus* Say. The former is smaller in size and has more pronounced abdominal sutures together with a flavescent marginal line on the anterior prothoracic lobe. The second species, while it may be larger or smaller, has a distinctly more slender form and noticeably long and slender legs and antennae. The genital character controls; it is well-figured by Parshley[1]. Weiss[2] experimented with *G. marginatus,* apterous, as to orientation to water, or, using the more technical expression, positive hydrotropism. He found that up to 9 yards distant from a pond they immediately made their way back: at 10 yards they began to experience difficulty; at 15, it increased, while at 30 or 40 yards they seemed to lose their bearings, moved aimlessly about and after a time seemed unable to find their way back to the water. The species is a

[1]1915. Ent. News xxvii: 103, fig. *b.* [2]1914. Can. Ent.: 33.

strong flier, and I have found it in ocean beach drift in July, on the shores of Long Island[3]. *Gerris lacustris,* so Griffini says[4], touches the water at times with the abdomen, which it rests on the surface. I have not seen *marginatus* do this. He also states that it has been observed to be attracted by mirrors.

Gerris marginatus begins to oviposit early in the spring; the eggs hatch out in ten days to two weeks, depending on the temperature. After five molts it reaches the adult in from 5 to 6 weeks. Unlike its larger congener *remigis,* it is a dweller in still waters by preference. Here at times it gathers in large numbers. In strong winds it hugs the shore, particularly if it blows that way. From early March to late November it may be found busy about its domestic affairs. The height of its abundance is between April and September. In early April they have been noticed mating; by May 20 to 26 adults and nymphs in one or two stages are seen together, and so through June and July, when they are found in several stages together. Its food is the same as that of *remigis,* except that being smaller it is not able to overcome quite such large insects. I have seen *marginatus* trying to capture *Notonecta undulata* which had flown to a pond and was on the surface struggling to submerge. The *Gerris* avoided reprisals by jumping up from the surface. On the other hand, it is one of the few waterbugs that fall a prey to frogs, and is, in fact, the only one I have seen recorded.

Its structure is characteristic of the genus; in fact, belonging in the typical subgenus, it closely approaches the generic and subgeneric type, *Gerris lacustris* Linné. In common with this species, *marginatus* rejoices in the phenomenon of pterygopolymorphism. Kirkaldy says[5]: *"lacustris* has provided me with more variations—at least six—than any other species. It is noteworthy that in the brachypterous forms, the two abbreviated elytra are not always equal in length and develop-

[3]1915. Ent. News xxvi: 277.
[4]1894. Gli Insetti Acquaioli p. 39.
[5]1899. Entomologist, xxxii: No. 432: p. 109.

ment in the same specimen." *Gerris marginatus* exhibits the same gradation from apterous to macropterous, going from one to the other by imperceptible degrees. Yet it is essentially an alate species, since the bulk are fully winged and only a small number totally apterous, with an indefinite proportion of varying degrees of brachypterousness. In this it differs from *remigis* and other species of the subgenus *Aquarius*, which are in general totally apterous with a very small number —an occasional specimen here and there—fully winged (except *conformis*, always found fully winged, and *alastor* Bueno MS., nearly always with rudimentary wings only). The most complete study of pterygopolymorphism is Reuter's "Polymorphisme des Hemipteres[6]." Here he covers the entire subject and hazards explanation based on selection. In *Gerris marginatus* and in general in the family, I see a gradual transformation to apterousness, through disuse, as exemplified by our *remigis* and the European *najas*, the fully winged being the primitive form, adapted to an existence on the water from an antecedent Reduvioid land bug, whose mobility depended on these members. The stream species, being in general safe from the consequences of droughts, are so independent of wings for transportation that these organs are nearly gone in most of them. The species inhabiting land-locked bodies of water must, however, always have some means of travelling if the water on which they live dries up, as so frequently happens with small ponds or water-holes. Hence wings still normally persist in these forms.

Structure, progression, respiration, reproduction are as in *G. remigis*. Dufour (op. c., p. 199), states that in *paludum* the digestive system is as in *canalium*, excepting the salivary gland.

Gerris marginatus, so far as known, has no egg parasites. Adults and nymphs are sometimes found with larval mites attached as in *remigis*, particularly about the head and thorax.

Egg. The egg is cylindrical, truncate at one end and round-

[6]1875. Bull. Soc. Ent. Fr., pp. 225/36.

ed at the other. The chorion is roughly shagreened, and under magnification x 975, shows very shallow pits. It has no indications of a lid or line of weakness along which to split. Length, 3 mm.; diameter, 1 mm.

The ova are clear white when first deposited, but change to brown as development of the embryo progresses. In hatching, the nymph emerges through a longitudinal split beginning at the truncate end and running about one-half to two-fifths the length of the egg. Three females gave 30 ova in four days. They were fastened a few on top of a piece of cork in the aquarium, and most in a clear colorless glue or jelly, along the edges of the cork and under the surface of the water. Garman[7] says the eggs are attached to aquatic plants. Dufour remarks (op. c., p. 347) "I have kept in vessels of water with water plants pregnant females of *Gerris paludum*, and I have assured myself they deposit their eggs one after the other, but not in contact, in a kind of mucilaginous jelly."

After eight or nine days the little bugs emerge. On June 9, one year, I secured thirty nymphs. Some seemed to molt right away, which I assume to be casting the amnion. In this connection, Dufour also says (l. c.) "I have seen the larvae born and I have sometimes found caught in the opening of the egg a fine membrane which was doubtless the immediate envelope of the larva, or which covered the interior of the egg-shell."

This pellicle cast by *Gerris marginatus* immediately on emerging covers the body legs and antennae, and is extremely hairy. It is so soft it loses its shape completely, although all the joints of antennae and legs are apparent and the tibial combs are all visible. All the tarsi, on emerging, are 1-jointed; all claws subapical; the antennae are very stout, the last joint as long as the others put together, and so far as could be seen in balsam mounts, apparently 3-jointed only. The lancets are also cast with this skin.

It is an open question in my mind whether or not this may

[7]189 Bull. Ills. St. Laby, N. H., iii: 172.

be considered a true molt. There are no perceptible differences between this nymph and the next, either as to size or structure, except the possible 3-jointed antennae noted. I am inclined to consider it akin to the subimago molt of the mayflies, rather than as a true ecdysis. This amnion, for want of a better term, resembles that covering certain Orthoptera, except that it is a complete pellicle. If it is a true molt *marginatus* has six. It may well be that this initial molt has gone unnoticed in the other Heteroptera, owing to the very diaphanous skin being blown away as soon as cast, and, in water, being unseen through its transparency and quickly destroyed by the mechanical action of the element.

First Instar. On emerging the nymph is about 1 mm. long, pointed oval in shape. The cylindrical antennae are 2/3 the length of the body, the first joint as long as 2 and 3 together, and 4 as long as the other three. The head is translucent honey-yellow, quite wide between the eyes, which are small, prominent, round and black. The rest of the insect, including the legs, which are rather thick in proportion to the size, is translucent white. There is a broad black stripe down the middle which crosses a similar stripe on the thorax and ends in a point at its cephalic margin. The abdominal segments are variously marked by the same black bands around the abdomen at the connexivum. The dorsum only is described, as it was taken from a living specimen.

The tibia of the anterior pair of legs is longer than the femur and of the second pair as well, but in the third pair, the femur is longer. The anterior tarsus is short and stout and the two other slender and long; all are single-jointed, with subapical claws. All the tibiae have combs. The rostrum is 4-jointed, stout, joints 1 and 2 subequal, shortest, 3 longest, 4 longer than either 1 or 2, tapering; no tactile hairs were noted at the tip. The legs are set very far back, which means that the abdomen is very short, the abdominal segments being narrow. The thorax is about 4 to 5 times as long.

In molting the vertex and front lift off like a lid hinged at the clypeus, and the thorax splits straight down the middle. The lancets are cast with rostrum, and there are no signs of tracheae in the cast skins.

The second true molt takes place in 3 to 5 days.

Second Instar. The antennae in this instar have joint 4 shorter than the other three together, 2 and 3 being subequal, and 1 twice as long as either. The first pair of legs continues the shortest, the second is the longest; the middle femur and tibia are subequal, in the other two, the tibia is longer than the femur. The thorax is two and a half times

as long as the abdomen, which has 7 and one genital segments. The prothorax is distinct.

Varying from 3 to 5 days, the bug molts for the second time.

Third Instar. The antennae continue to change. The 4th joint is still the longest, 3 the shortest, followed by 2 and 1 in the order given. The eyes are reniform. In the legs, the femora are longer than the tibiae in the 1st and 3rd pairs, and subequal in the second. The abdomen is longer and the legs appear set less far back. In other respects there are no perceptible changes.

The third molt follows the second in 3 to 6 days.

Fourth Instar. In this instar the antennae continue to change, and the differences in length are not so great; joint 4 is still the longest, but 2 and 3 are subequal and the shortest, 1 being not greatly shorter than 4. The femur and tibia of the anterior legs are subequal; and the femur is longer in the 2d and 3d pairs. The hind femora have dark spots from which arise long setae. The abdomen has further increased in length, the segments being wider and more distinct. Joint 3 of the rostrum is the longest, 2 is the shortest and 4 is as before, and nearly equal to 1. All tibiae have combs and all claws are simple.

The fifth instar is reached in 3 to 5 days.

Fifth Instar. In this instar the form and general appearance of the nymph begin to approach more closely to the adult. The head is rounded and set with long setae, the eyes are reniform. In the antennae joints 1 and 4 are subequal, and longer than 2 and 3, which are also subequal. The chief antennal difference is at the base of the third antennal joint which has a pedicellate appearance. The rostrum is the same as before, except that the 3d joint is much longer in proportion. The prothorax is differentiated and the mesothorax distinct, with a minute scutellum. The wing-pads are notable and reach half-way to the 4th abdominal segment. The legs are as before, with thicker femora than tibiae. The second and third femora have the dark setigerous spots, and the third in addition is set with spines. The middle tarsi are much elongate, and all the tarsi continue single-jointed. Abdominal segments are very distinct and the two genital segments very prominent. In the cast skin two long slit-like spiracles are seen in the mesothorax in front of the intermediate coxae.

In five to seven days the little bug molts for the fifth and last time, and reaches the adult. The chief changes in structure in the external skeleton are the two-jointed tarsi, the node at the base of the third joint of the antennae, the much larger eyes in comparison to the head and the prothorax and mesothorax fused together.

The entire internal anatomy of *Gerris marginatus* is still to be worked out, and the external organs of respiration as well.

These are the detailed instars and molts of the specimens it was possible to breed to maturity. It is to be noted that these transformations represent an extreme as all conditions were favorable. There was the warmth of summer and an abundance of food, even though it changed not at all from day to day.

GERRIS MARGINATUS—LIFE HISTORY.

Ova Deposited	Embryo Period	Emerged Date	Instar I	Molt I	Instar II	Molt 2	Instar III	Molt 3	Instar IV	Molt 4	Instar V	Molt 5
No. 1												
?	?	June 29-07	8 days	July 7	3 days	July 10	4 days	July 14	3 days	July 17	6 days	July 23
No. 2												
?	?	"	8 "	"	3 "	" 10	6 "	" 16	4 "	" 20	7 "	" 27
No. 3												
♀ June 1-08	8 days	June 9	7 "	" 16	4 "	" 20	3 "	" 23	4 "	" 27	6 "	" 3
No. 4												
♂ June 1-08	8 "	"	7 "	"	5 "	" 21	3 "	" 24	4 "	" 28	6 "	" 4
No. 5												
♀ June 1-06	8 "	"	7 "	"	4 "	" 22	4 "	" 24	5 "	" 29	5 "	" 1
No. 6												
?	?	June 25-07	8 "	" 3	4 "	" 7	2 "	" 9	7 "	" 16	6 "	" 22

No. 1—Emergence to adult, 24 days
" 2— " " 28 "
" 3—Oviposition " 33 "
Emergence " 25 "
" 4—Oviposition " 34 "
Emergence " 26 "
" 5—Oviposition " 34 "
Emergence " 26 "
" 6— " " 27 "

One of 45 ova deposited by one female.

These life histories give a period of between 33 and 34 days for the full transformations from the egg to the adult, and of between 24 and 28 days for the five nymphal instars.

Briefly, then, *Gerris marginatus* has one embryonic, 5 nymphal (or if the first tenuous molt be considered a true ecdysis, 6), and one adult, a total of seven instars, which take about a month. This would allow for three broods a summer.

Feeding Habits of Adult Chrysopidae (Neur.).

I have taken adult Chrysopidae (*Chrysopa* sp.) on flowers with exposed nectar: *Pastinace sativa*, June 15 and 24, 1886; *Tiedemannia rigida* (*Oxypolis rigidior*), Aug. 15, 1888. These visits were mentioned under Neuroptera in Trans. St. Louis Acad. Science 5: 459. They are not cited by Knuth, *Handbuch der Blütenbiologie*, III. 2: 469, but visits of a *Chrysopa* sp. to *Yucca whipplei* are there recorded.—CHARLES ROBERTSON, Carlinville, Ill.

Some Bees of the Genus Psaenythia (Hym.).

By T. D. A. Cockerell, Boulder, Colorado.

Many years ago Professor L. Bruner collected three species of the wasp-like Panurgid genus *Psaenythia* at Carcarana, Argentina. They were sent to the National Museum, and are now in my hands for determination. One proves to be a female of *P. picta* Gerst., but the others are considered new.

Psaenythia thoracica crawfordi n. subsp.

Larger than true *P. thoracica* from Paraná, about 8.5 long in both sexes; female with lower border of clypeus black, and the black on disc extending upward as two large wedge-shaped marks; supraclypeal area black; mesothorax, scutellum, postscutellum and two transverse marks on basal part of metathorax red; pale yellow abdominal bands narrowly interrupted on first two segments, constricted but not interrupted on third and fourth, very narrowly interrupted on fifth. Male with face cream-colored below antennae, the supraclypeal mark notched above; anterior margin of mesothorax broadly black; no red on metathorax; all the abdominal bands interrupted.

The female, in my collection, was received from the National Museum, labelled *P. thoracica* Gerst. by Mr. Crawford. The male (Bruner 33) evidently belongs with it. In spite of the greater size, I should not separate this from *P. thoracica* (described from the male), but for the fact that Friese has the female of that insect (from Villa Rica, Paraguay), and states that the abdomen has on each side of segments 1-5 a small yellow three-cornered spot. Since Friese's insect is from a region comparatively near the type locality, there is no reason to doubt that it represents the species correctly; *P. thoracica crawfordi* is evidently a well-marked subspecies from the desert regions of the interior.

Psaenythia pachycephala n. sp.

♂.—Length about 10 mm., robust; head very broad; eyes rather small, green, strongly diverging below. Black, with clear ferruginous legs, the markings cream-color, those on face and mandibles lemon-yellow. Mandibles long, yellow on outer face except at apex; clypeus (which is extremely broad and low), labrum, large dog-ear marks, and space between clypeus and dog-ear marks and orbits yellow, the lateral yellow ending above horizontally, not quite reaching level of top of dog-ear marks; a cream-colored mark on upper part of each

cheek behind; facial foveae oblique; vertex shining but well punctured; flagellum clear ferruginous beneath except at base, antennae otherwise nearly black. Mesothorax and scutellum shining and sparsely punctured, metathorax dull; cream-colored markings consisting of interrupted line on collar, ends of tubercles, spot behind tubercles, spot at each anterior corner of scutellum, band on postscutellum, spots on knees (extending to stripes on anterior femora), and bands on abdominal segments 1-6, on first segment reduced to a pyriform mark on each side, on second and third broadly interrupted, on fourth narrowly interrupted, on fifth and sixth hardly more than constricted; tegulae clear fulvous; wings yellowish, dusky apically, stigma amber-color; apical plate of abdomen broadly truncate, the truncation slightly excavated. (Bruner 59.)

♀.—Length about 10 mm.; differing from the male thus: Head ordinary, though broader than long; mandibles black, with a ferruginous patch; face black, except for a pair of large quadrate patches, broader than long, taking in the dog-ear marks and the space between these and the orbits; mesothorax and scutellum rather densely punctured; bands on first two abdominal segments rather broadly interrupted, on third narrowly, on fourth very narrowly, on fifth entire; fringe at end of abdomen black; spur of middle tibia as long as basitarsus, remotely short-pectinate. (Bruner 60.)

The sexual difference in the sculpture of the thorax is parallel with that observed in *P. philanthoides* Gerst.

Related to *P. rubripes* Friese, from which it is known by the much darker antennae, spotted scutellum, and the large light patches on face of female. According to the description, *P. rufipes* Holmbg. appears to be very similiar, differing by the color of the flagellum and the form of the face-markings. Schrottky states that *rufipes* is a variety of *P. picta,* which *P. pachycephala* certainly is not.

Physiographic Divisions of the United States.

Entomologists studying geographical distribution will find useful a monograph by Nevin M. Fenneman, under the above title, forming pages 19-98 of volume VI of the *Annals of the Association of American Geographers.* It attempts "to divide the United States into natural or physical units which should be as nearly as possible homogeneous with respect to certain criteria.....All orders of divisions rest ultimately on existing differences in topography and elevation. But the differences considered are those which pertain to physiographic types and not merely superficial appearance." It is accompanied by a preliminary map of the United States 42.5 x 17 inches. Copies may be purchased for 26 cents from the Secretary and Editor of the Association, Prof. Richard E. Dodge, Washington, Connecticut.

Origin and Development of the Photogenic Organs of Photuris pennsylvanica De Geer (Col.).*

By Walter N. Hess.

In spite of the fact that the light organs of fire flies have been the object of much study during the past century, comparatively little has been done on their development. However, during the past few years this phase of the subject has received more attention, though as yet, no one has definitely demonstrated their embryonic origin.

There are at present three conflicting views regarding the origin of the photogenic organs. One view is that they are modified hypodermal cells, another that they are formed from both ectoderm and mesoderm, and lastly, that they are derived from fat cells. Of these three views, that of the fat cell origin has been the most generally accepted.

Among the earlier workers who favored the idea of ectodermal origin was Owsjannikow (1868), but his observations are of little value since he studied only the adult organ.

The question of origin can be settled only by a study of the development of the photogenic tissues. With the exception of two recent papers, Vogel (1912), and Williams (1916), this has not been done by any one except Dubois. Dubois (1898) studied the development of both *Lampyris noctiluca* and *Pyrophorus noctiluca*. He believed that he was able to follow the development of the photogenic organs through the different stages, from the beginning of segmentation, to the adult insect. He discovered a close histological resemblance between the blastoderm cells and the photogenic cells of the larva, pupa and adult. Furthermore, he concluded that the cells of the hypodermis multiply, and by proliferation form directly the photogenic organ of the larva.

For some reason Dubois' work has attracted little attention and is practically ignored in general discussions of the subject. Moreover he misinterpreted the normal structure of the body wall in *Lampyris,* and for this reason his conclu-

* Contribution from the Entomological Department of Cornell University.

sions have been severely criticised by the few who have discussed them.

Wielowiejski (1890), in opposition to Dubois, states that the so-called reflective or urate layer of the photogenic organ is derived from fat cells; the light giving or luminous layer, on the contrary, is composed of cells derived from oenocytes, hence ectodermal. Here again the statements are based on a study of mature organs, and hence are not conclusive.

With the exception of the two previously mentioned papers by Vogel and Williams, all authors who favor the theory of fat cell origin have based their conclusions only on a study of the adult organs. Many of these, including Leydig (1857), Schultze (1865), Wheeler (1892) and Berlese (1909) seem to be of this opinion, largely because the structure of the mature organ resembles somewhat that of fat cells, and also because certain cells of the photogenic organs secrete urates and other products, comparable with fat cells.

Recently two important papers have appeared which apparently definitely settle the question in favor of the fat cell origin, one by Vogel (1912), the other by Williams (1916).

Vogel studied the embryonic development in *Lampyris noctiluca,* beginning with a stage in which the organ was already clearly differentiated. He made a comparative histological study of its cells and those of the neighboring tissues, from which he concluded that the cells of the photogenic organ, in this stage, agree with the neighboring fat cells in shape, size and relations of their nuclei. On this he based his conclusions that the light organ arises from fat cells.

It should be noted that Vogel found the organ in its early development closely applied to the hypodermis, while at a later stage it was definitely separated from it.

Williams (1916) worked upon our native species, *Photuris pennsylvanica,* and apparently confirmed completely the work of Vogel. He maintains that the cells of the photogenic organ form a gradual gradation from the rather dark pigmented cells lying against the hypodermis, through those on the side towards the fat cells and continuous with them.

Unaware of Williams' work, which did not appear until late December, the writer had undertaken a study of the embryonic development of the photogenic organs of *Photuris pennsylvanica*. This work was at the suggestion of Dr. W. A. Riley, to whom the writer is indebted for helpful advice and criticism in the completion of this paper. On the basis of this work he is forced to conclude that neither Vogel nor Williams studied the organ in its earliest development, and that they drew mistaken conclusions from observations of organs already developed beyond the critical stage.

Material for study was obtained by confining the adult insects in small jars that were partly filled with earth and moss. Since oviposition occurred very readily in captivity, it was easy to obtain a complete series of eggs by removing the insects to different jars each day. During the summer of 1916 the eggs of this species hatched in from 25 to 27 days, depending on temperature, with an average of 26 days. Eggs were killed in hot water, dehydrated and imbedded in paraffin. Sections were cut three and four microns thick. As it was often difficult to find the eighth abdominal segment, sagittal sections were by far the most satisfactory. Heidenhain's iron haematoxylin was very satisfactory for staining. Various other stains were tried with less success. Eosin was sometimes used as a counter stain.

It was found in the 14-day embryos, that the hypodermis on the ventro-lateral portion of each side of the eighth abdominal segment, in its anterior region, showed a definite thickening, due to proliferation and enlargement of the cells, as shown in Fig. 1, (H). The nuclei of the cells were also larger than those of other hypodermal regions.

In the 15-day embryos the organ appeared as a distinct nodule which projected from the inner surface of the hypodermis (Fig. 2, P). At this stage there was no evidence of any separation from the hypodermis. In fact the hypodermal cells extended up slightly between the cells of the nodule itself.

By studying a large number of embryos it was definitely

determined that there was no evidence of any relation between the fat cells and those of the nodule, in this, or the 14-day embryos. At this age the cells and nuclei of the nodule are much larger than those of the hypodermis. In fact they somewhat resemble the fat cells, though the nuclei are larger. Moreover, the chromatin in the nuclei of the photogenic organ is of a coarse irregular nature resembling closely that of the

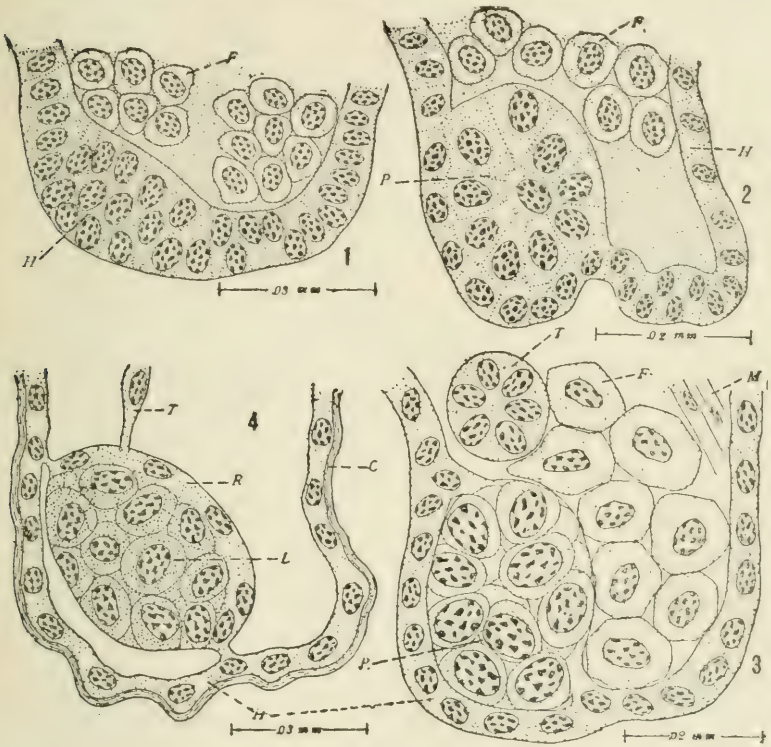


Fig. 1.—Sagittal section of the ventro-lateral eighth abdominal segment of a 14-day embryo through the middle of the photogenic organ. *F*, fat cell; *H*, hypodermis thickening to form the photogenic organ.

Fig. 2.—Sagittal section of the ventro-lateral eighth abdominal segment of a 15-day embryo through the middle of the photogenic organ. *F*, fat cell; *H*, hypodermis; *P*, photogenic organ or nodule.

Fig. 3.—Sagittal section of the ventro-lateral eighth abdominal segment of a 17-day embryo through the middle of the photogenic organ. *F*, fat cell; *H*, hypodermis; *M*, muscle; *P*, photogenic organ; *T*, trachea.

Fig. 4.—Sagittal section of the ventro-lateral eighth abdominal segment of a 26-day embryo through the middle of the photogenic organ. *C*, cuticula; *H*, hypodermis; *L*, luminous layer of photogenic organ; *R*, reflective or urate layer; *T*, trachea.

hypodermal cells, rather than that of the fat, which is of a finer nature. The cells of the light organ at this stage appear somewhat vacuolated, especially those farthest away from the hypodermis. This fact is not surprising since this portion soon forms the less dense or reflective layer. The hypodermis itself often shows a vacuolated condition.

In the 16- to 17-day embryos the organ is completely separated from the hypodermis, except at its two ends where it remains attached, the organ being elongated in the direction of the two attachments. The appearance of the photogenic cells at this stage is very similar to that of the 15-day embryos, except that their cell boundaries seem more distinct. However the cells farthest away from the hypodermis appear more vacuolated. Until now, cell division has been but slight, however at this time these large active nuclei are dividing considerably.

From Vogel's and Williams' descriptions of the earliest condition of the light organs that they observed, one would be led to believe that it was the study of this stage of development on which they based their conclusions regarding its origin. At this time the fat cells lie in rather close proximity to the light organ, and somewhat resemble it.

In embryos 19 to 20 days old, there occurs a differentiation of the cells of the photogenic organ, by which the two layers are formed. The tracheal and nerve connections become fully established about this time, for in the 22-day embryos light was being emitted from the photogenic organ.

In the 26-day embryos (Fig. 4,) the two layers are very distinct. Cell boundaries were definitely observed in the luminous layer, though no cell walls were distinguished in the reflective area. At this period there is considerable difference in the nuclei of the two regions. Those of the reflective layer appear smaller and more elongate than those of the luminous area. The cytoplasm of the luminous portion is very granular and appears slightly alveolar, while that of the reflective layer, though somewhat alveolar-like, contains comparatively few granules.

The narrow hypodermal ligaments which are continuous with the hypodermis and the photogenic organ, often appear longitudinally striated, due probably to a slight modification of the hypodermis in those regions. In a sagittal section these attachments are continuous longitudinally with the reflective layer, the region between these attachments next to the hypodermis being occupied entirely by the luminous cells. Since the reflective layer lies like a cap over the inner portion of the photogenic organ, its cells cover all of the organ except that portion next to the hypodermis.

At the meeting of the American Society of Zoologists, at New York, in December, 1916, Dahlgren reported observations which he had made on the development of the adult organs in the pupa of *Photuris pennsylvanica*. He found that the larval organs degenerated, and that new ones were formed, in different body segments, by the proliferation of hypodermal cells. Williams in his work on the development of the light organs in the pupa concludes that they are derived from fat cells. However he states: "The photogenic organ, when in the process of formation, frequently suggests a hypodermal origin, for it is then rather structureless and closely applied to the body wall. Indeed some sections show the hypodermis sending up extensions between the cells of the organ." My observations on the pupal development of the photogenic organ, though essentially the same as quoted from Williams' paper, have led me to conclude, as Dahlgren, that the adult organs in the pupa arise from hypodermis.

Wheeler and Williams (1915) in their study of a mycetophilid fly of the New Zealand caves, find that the light organs are a modified portion of the Malpighian tubules. These structures, as is well known, are of ectodermal origin, and this furnishes a clear instance of light organs from the ectoderm in insects.

All the evidence which I have obtained from the studies above outlined, strengthen my belief that Vogel and Williams were mistaken in their interpretations of the early light organ, and that, instead of arising from fat cells, the em-

bryonic organ is formed by a proliferation of hypodermal cells, which are ectodermal in origin.

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Ibid. 1890. Contributions a l' histoire des Organes Lumineux chez les Insectes. Bull. Sci. Fr. Belg. XXII: 166-172.

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An Active Ant-killer (Arach., Solpugid.).

April 25th of this year, Mr. Frank B. Richardson, of San Diego, Texas, sent me a specimen of an interesting Solpugid, *Eremobates magnus* (Hancock), which was determined by Mr. Clarence R. Shoemaker, of the National Museum. Mr. Richardson found the specimen destroying large sized ants. He took it to an ant hill, and in a few minutes it killed "hundreds of ants." Mr. Richardson pointed out that these ants are a great pest at San Diego and especially to freshly planted seeds. He stated that they had carried away about 20 pounds of grass seed which he recently sowed. He further stated that he would very much like to "promote the multiplication" of this important ant enemy.—L. O. Howard, U. S. Bureau of Entomology, Washington, D. C.

Notes on the Earwigs (Dermaptera) of North America, north of the Mexican Boundary.

By Morgan Hebard, Philadelphia, Pa.

The Philadelphia collections contain material of all the species of Dermaptera native to, or adventive in, these regions. It is the purpose of the present paper to list the native species, giving their synonymy and in each case the first incorrect use of a name for the species based on material from the regions here considered; to record hitherto unreported material before us, and to give briefly the local habitat and known distribution of each species. One new species is described. The nomenclature shows but little recent change; *annulipes* having been transferred by Burr from *Anisolabis* to *Euborellia*, while the series now at hand prove beyond question the distinctness of the species of the Unidentata Group of the genus *Prolabia* found in Hayti and in the southeastern United States, the correct name for the latter insect being *pulchella* of Serville.

Though the different North American species have been frequently mentioned in the literature, few studies in any way comprehensive have appeared.[1]

The order is but weakly represented in the regions here treated, except in the subtropical and tropical areas of the southern United States, and constant field work has been necessary to assemble even the small total here recorded.

Fifteen species are represented, of which four may be said to be confined in distribution to the restricted tropical areas

[1]Of these the most important are:—

1876. Brief Synopsis of North American Earwigs, with an Appendix on the Fossil Species, by Scudder. Bull. Geol. Geogr. Surv. Terr., II, pp. 249-260.

1911. The Earwigs of the United States National Museum, by Burr. Proc. U. S. Nat. Mus., XXXVIII, pp. 443-467.

1913. Notes on Nearctic Orthopterous Insects. I. Nonsaltatorial Forms, by Caudell. Proc. U. S. Nat. Mus., XLIV, pp. 595-599.

1914. United States and Mexican Records of Species of the Genus Doru (Dermaptera; Forficulidae), by Rehn and Hebard. Jour. N. Y. Ent. Soc., XXII, pp. 89 to 96.

of the southern United States, while two are found only in the subtropical desert of the southwest. A total of 432 specimens is recorded, of which 309 belong to the Philadelphia collections.

Our thanks are due to those who have assisted in permitting the examination of material, either their own property or in their care.

LABIDURIDAE.

PSALINAE.

1. **Anisolabis maritima** (Géné).

1832. *Forficula maritima* Géné, Sagg. Monogr. Forfic. Indig., p. 9. [Nice, France; Genoa and Tuscany, Italy; along Mediterranean.]

1853. *Anisolabis maritima* Fieber, Lotos, III, p. 257. [Exotic records; South Carolina.] (Generic assignment and first United States record.)

New York: Larchmont, XI, 27, 1902, (T. D. O'Connor), 1 ♂, [Hebard Cln.].

New Jersey: Palisades, 1901, (E. Daecke), 2 ♀, [A. N. S. P.].

Florida: Long Boat Key, 1 ♀, [Hebard Cln.]; Key West, (Agassiz; Morrison), 6 ♂, 8 ♀, [M. C. Z.]; Warrington, VIII, 4, 1903, (A. P. Morse), 1 juv., [Morse Cln.]; Fort Barrancas, VIII, 3, 1903, (A. P. Morse), 2 juv., [Morse Cln.].

Texas: Virginia Point, VII, 21, 1912, (M. Hebard; common under boards among low grasses on raised beach), 4 ♂, 3 ♀, 1 juv., [Hebard Cln.].

This insect is found under litter on the ground. It is usually met with in the largest numbers under drift on sea beaches. The species does not appear to exist far from salt water. It is generally distributed along the Gulf coast and the Atlantic coast as far north as Maine.

2. **Euborellia annulipes** (Lucas).

1847. *Forficelisa annulipes* Lucas, Bull. Soc. Ent. France, (2), V, p. LXXXIV. [Jardin des Plantes, Paris; probably introduced from North America.]

1905. *Anisolabis annulipes* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1904, p. 778. [Thomasville, Georgia.] (First United States record.)

1905. *Anisolabis azteca* Caudell, Ent. News, XVI, p. 216. [Jacksonville, Florida.]

1915. *Euborellia annulipes* Burr, Jour. R. Microsc. Soc., 1915, p. 545. (Generic assignment.)

Georgia: Tybee Island, VI, 20, (D. M. Castle), 1♂, 1♀, [A. N. S. P.].

Florida: Lake Worth, (Mrs. A. T. Slosson), 1♂, 1♀, [M. C. Z.]; Miami, III, 4, 1916, (M. Hebard; Musa Isle, orange grove, occasional under debris on sandy soil), 1♂, 3♀, 2 juv., [Hebard Cln.].

Alabama: Springhill, Mobile County, VIII, 25, 1915, (Rehn & Hebard; under signs on oaks), 1♂, 3♀, 3 juv., [Hebard Cln. and A. N. S. P.].

Mississippi: Agricultural College, (H. E. Weed), 2♂, 2♀, 3 juv., [A. N. S. P.]; Ocean Springs, I, 1905, (J. H. Comstock) 6♂, 6♀, 16 juv., [Cornell Univ. Cln.].

Louisiana: Nairn, XI, 1892, (H. E. Weed), 1♀, [A. N. S. P.].

Texas: Alvin, XI, 8, 1904. (Miss M. Hillje), 1♂, 1♀, [A. M. N. H.]; Laredo, VIII, 12, 1912, (M. Hebard; in drug store), 1♀, 1 juv., [Hebard Cln.].

Arizona: Phoenix, 1♀, [Hebard Cln.].

California: Folsom, VII, 19, 1885, 1♀, [M. C. Z.]; Mesa Grande, Sonoma County, IX, 30, 1906, (J. C. Bradley), 1♀, [Cornell Univ. Cln.]; Redlands, XII, 25, 1912, 1♂, 2♀, [Hebard Cln.]; Los Angeles, 1887, (D. W. Coquillett), 1♀, [Hebard Cln.]; Coronado, (F. E. Blaisdell), 2♂, 3♀, 1 juv., [Hebard Cln.].

This earwig is found under litter of every sort, sometimes under signs on trees and rarely in houses. It is more often found inland than under drift on sea beaches.

The species has been recorded from Philadelphia, Pennsylvania, and the District of Columbia; it should be considered adventive at these places. The species is now known from along the southern border of the United States, except in trans-Pecos Texas, New Mexico and eastern Arizona. The northernmost records, in addition to those given above, are: Raleigh, North Carolina; Camden and Columbia, South Carolina; Augusta and Macon, Georgia, and Montgomery, Alabama. It is generally distributed and numerous in southern Florida, the Florida Keys and southern coastal California.

LABIDURINAE.

3. **Labidura bidens** (Olivier).

1791. *Forficula bidens* Olivier, Encycl. Method., Ins., VI, p. 466. [Jamaica.]

1876. *Labidura riparia* Scudder (probably not *Forficula riparia* Pallas, 1773), Bull. U. S. Geol. Surv. Terr., II, p. 250. [Exotic records; Texas; Florida.] (First United States records.)

1905. *Labidura bidens* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1904, p. 777. [Thomasville, Georgia.] (Following Kirby's generic assignment, first United States record as *bidens*.)

1908. *Labidura erythrocephala* Burr, Bull. Mus. Hist. Nat. Paris, 1907, p. 512. [Savannah, Georgia.]

The description of *riparia*, from Siberia, is not sufficient to locate that species. It seems best to use the name *bidens* for the insect here considered until Siberian material can be obtained and the problem definitely solved.

Mississippi: Ocean Springs, I, 1905, (J. H. Comstock), 1 ♂, [Cornell Univ. Cln.].

Louisiana: Spanish Fort, New Orleans, VI, 29, 1916, (Lutz & Rehn; in pavilion), 2 ♀, 1 juv., [A. M. N. H. and A. N. S. P.].

Texas: Galveston, VII, 19, 1912, (M. Hebard; under board on sand near beach), 1 ♂, [Hebard Cln.]; Alvin, VII, 27, 1907 and XI, 8, 1904, (Miss M. Hillje), 1 ♂, 1 ♀, [A. M. N. H.].

This insect is usually found under litter on the ground. It frequently comes to light at night. It is often encountered under drift on sea beaches.

The species is widely distributed in Florida and southern Georgia, extending north along the Atlantic coast to Savannah. North of that point it is known only from a "South Carolina" record and one from Raleigh, North Carolina. Westward it is known only from the localities given above.

LABIIDAE.

Spongophorinae.

4. **Vostox brunneipennis** (Serville).

1839. *Psalidophora brunneipennis* Serville, Hist. Nat. Ins., Orth., p. 30. [Philadelphia, Pennsylvania.]

1876. *Spongophora brunneipennis* Scudder, (in part), Bull. U. S. Geol. Geogr. Surv. Terr., II, p. 252.. [Exotic record; Pennsylvania; Kentucky to Florida; Texas[2].] (Generic assignment.)

1911. *Vostox brunneipennis* Burr, Deutsch. Ent. Nat.-Biblioth., II, p: 59. (New genus described with *brunneipennis* as genotype.)

North Carolina: Southern Pines, IV, 17, 1915, (A. H. Manee), 1 ♀, 2 juv., [Hebard Cln.].

Kentucky: Cumberland Gap, VII, 1876, (G. Dimmock), 1 ♂, 1 ♀, 7 juv., [M. C. Z.].

[2] Arizona is also given, this taken, however, from material of *Spongovostox apicedentatus*.

Louisiana: Arcadia, VIII, 20, 1915, (Rehn & Hebard; in great numbers under bark of dead birch, many immature individuals not taken; *Prolabia pulchella* also present, but much less numerous), 23 ♂, 33 ♀, 39 juv., [Hebard Cln. and A. N. S. P.].

This species is usually found under the bark of dead trees. We have found it only on magnolia and birch.

The insect has a very wide distribution over the southern and eastern portions of the United States, but is so rarely encountered that the records give little definite information as to the limits of its distribution. In Florida it has not been taken south of Enterprise. The most western records are Clifton and Columbia, Texas. The most northern are Dallas, Texas[3]; Arcadia, Louisiana; Cumberland Gap, Kentucky, and Philadelphia, Pennsylvania. The insect has once been found locally in very large numbers and has been reported common in Texas by Belfrage. Over the greater portion of its distribution in the United States it may, however, rightly be termed a rare species. The distribution in the Americas of this species and *Doru lineare,* are the widest known for any non-domiciliary earwigs of the New World.

5. **Spongovostox apicedentatus** (Caudell).

1876. *Spongophora brunneipennis* Scudder, (in part, not *Psalidophora brunneipennis* Serville, 1839), Bull. U. S. Geol. Geogr. Surv. Terr., II, p. 252. [Arizona.]

1902. *Spongophora brunneipennis* Scudder and Cockerell, (not *Psalidophora brunneipennis* Serville, 1839), Proc. Davenport Acad. Sci., IX, p. 18. [La Cueva, Organ Mountains, New Mexico.]

1904. *Labia melancholica* Rehn, (not of Scudder, 1876), Proc. Acad. Nat. Sci. Phila., 1904, p. 562. [Florence, Arizona.]

1905. *Spongophora apicedentata* Caudell, Proc. U. S. Nat. Mus., XXVIII, p. 461, fig. 1a. [Columbia, Texas; Catalina Springs, Tucson (type locality) and Fort Yuma, Arizona; Los Angeles and San Diego Counties, California.]

1911. *S[pongovostox] apicedentatus* Burr, Deutsch. Ent. Nat.-Biblioth., II, p. 59. (Generic assignment.)

Arizona: Sabino Basin, Santa Catalina Mountains, 3800 feet, VII, 8 to 20, 1916, (Lutz & Rehn), 1 ♀, [A. M. N. H.]; Sabino Cañon,

[3]Bruner's southeastern Nebraska record of the species may be valid, but seems decidedly doubtful. No material from that region is to be found in the Bruner Collection.

Santa Catalina Mountains, III, 10 to V, 2, 1916, (J. F. Tucker; 36 from dead Sahuaro), 13♂, 31♀, 4 juv., [Hebard Cln.]; Tucson, VII, 3 to 5, 1916, (Lutz & Rehn), 1♀, [A. M. N. H.]; Santa Cruz Village, Comobabi Mountains, VIII, 10 to 12, 1916, (Lutz & Rehn; from dead and sour Sahuaro), 2 juv., [A. M. N. H. and A. N. S. P.].

This species is apparently the only indigenous earwig of the southwestern desert regions and is a difficult insect to locate. It has usually been found in dead Sahuaro or Giant Cactus, *Cereus giganteus,* but extends its range far beyond that of the plant. In addition to the records given above and those of the references, the species has only been recorded from Isabel, Texas.

6. **Labia minor** (Linnaeus).

1758. *Forficula minor* Linnaeus, Syst. Nat., (10), 1, p. 423. [Europe.]

1838. *Labia minor* Doubleday, Ent. Mag., V, p. 279. [Wanborough, New York.]

1862. *Labia minuta* Scudder, Bost. Jour. Nat. Hist., VII, p. 415. [Massachusetts; Virginia.]

Ontario: Ottawa, IX, 8, 1912, (J. I. Beaulne), 4♂, 2♀, [A. N. S. P. and Hebard Cln.].

Maine: Norway, (S. J. Smith), 5♂, 1♀, [M. C. Z.].

Massachusetts: Beverley, VI, 1, 1866, (E. Burgess), 1♀, [M. C. Z.]; Medford, VI, 1907, 1♀, [M. C. Z.]; Cambridge, XI, 1, 1881, 1♂, 1♀, [M. C. Z.]; Wollaston, 1883, (F. H. Sprague), 1♂, [M. C. Z.]; Chicopee, X, 15, 1897, 2♂, 4♀, [A. N. S. P. and Hebard Cln.].

Rhode Island: Providence, V, 25, 1871, (outside stable), 6♂, 27♀, [M. C. Z.].

New York: Ithaca, VIII, 1 and 9, 1901 and 1904, [Cornell Univ. Cln.]; Albany, (Peck), 1♂, [M. C. Z.]; Tuxedo, V, 23, 1900, (T. D. O'Connor), 1♀, [Hebard Cln.].

New Jersey: Boonton, VII, 23, 1901, (G. M. Greene), 1♂, [A. N. S. P.].

Pennsylvania: Philadelphia, IV, 26, 1915, (J. A. G. Rehn), 1♂, [A. N. S. P.]; Frankfort, 1♀, [A. N. S. P.]; Chestnut Hill, VII, 1903, (M. Hebard; flying at dusk), 1♀, [Hebard Cln.]; St. Martins, VII, 5, 1916, (M. Hebard; flying before dusk), 1♀, [Hebard Cln.]; Olney, VII, 3, 1915, (M. Hebard; flying at dusk), 1♀, [Hebard Cln]; Wyoming, VII, 21, 1903 and IX, 1904, (G. M. Greene), 1♂, 1♀, [A. N. S. P.] (these five localities in Phila.); Bryn Mawr, VI, 27, 1908, (M. Hebard; under board on manure pile), 2♂, 4♀, [Hebard Cln.];

Swarthmore, IX, 19, 1916, (E. T. Cresson, Jr.), 1♂, [A. N. S. P.].

Delaware: Delaware City, VII, 25, 1899, 1 ♂; [M. C. Z.].

Virginia: Hot Springs, VII, 29, 1916, (M. Hebard; flying before dusk), 1 ♂, [Hebard Cln.].

Wisconsin: Sparta, VIII, 7, 1896, (J. E. McDade), 1 ♂, 1 ♀, [M. C. Z.].

Manitoba: Aweme, IX, 11, 1909, (N. Criddle), 4 ♂, [Hebard Cln. and A. N. S. P.].

Nebraska: Lincoln, VIII and IX, 7 ♂, 8 ♀, [Hebard Cln. and A. N. S. P.].

California: Sonoma County, IV, 16, 1 ♀, [Hebard Cln.]; Claremont, (C. F. Baker), 2 ♂, [A. N. S. P.]

The species is frequently encountered in flight at, or just before, dusk. It is often numerous under debris about manure.

This minute insect, an adventive from Europe, has become widely distributed in the United States. It is the only earwig known from Canada, where it has been taken as far north as Quebec, Quebec. There are no records of its occurrence south of the Fall Line in the southeastern United States, except at Unadilla, Georgia,[4] or from the Great Plains west to the Californian Sierras.

7. **Labia rehni** new species.

1914. *Labia minor* Rehn and Hebard, (not *Forficula minor* Linnaeus, 1758), Proc. Acad. Nat. Sci. Phila., 1914, p. 377. [Key West, Florida.]

Though very similar to *Labia minor* in general appearance, the unique female of this interesting species before us, is found to differ widely from females of that species, in the much smaller eyes, more ample pronotum, much shorter tegmina and wings, distinctive pygidium and forceps with ventro-internal margins not attingent, not perfectly straight and armed with microscopic, blunt serrulations.

Type: ♀; Key West, Florida. July 7, 1912. (Rehn & Hebard; under boards in store-house.) [Hebard Collection Type No. 439.]

Size very small; form moderately slender, very slightly more robust than in *L. minor*. Head, pronotum, tegmina, wings, abdomen and

[4] The record by Rehn and Hebard from Key West, Florida, applies to *Labia rehni*.

forceps thickly clothed with short microscopic hairs. Head as in *minor*, but with eye only about three-fifths length of cheek[5]. Pronotum ample; lateral margins straight, parallel; caudal margin convex. Tegmina short, only a little longer than pronotum[6]; truncate caudad. Wings projecting beyond tegmina less than half the pronotal length[7]. Scent glands subobsolete. Untimate dorsal abdominal segment simple, as in *minor;* fully three times as wide as long, caudal margin transverse. Pygidium declivent; lateral margins feebly concave, subparallel; distal margin strongly concave, so that the latero-caudal portions of the pygidium project caudad as slender, acute, conical projections. Forceps moderately heavy, triquetrous in proximal portion; dorsal sur-

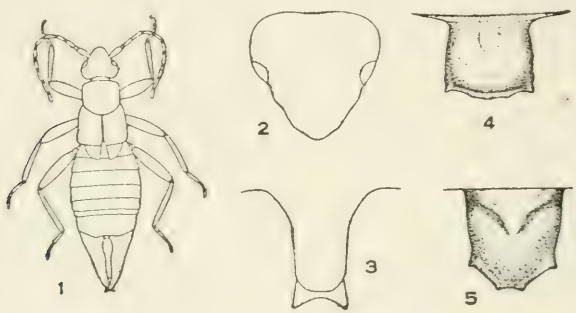

Fig. 1.—*Labia rehni* n. sp. Dorsal outline of type. (X 5.)
Fig. 2.—*Labia rehni* n. sp. Dorsal outline of head. Type, ♀. (Much enlarged.)
Fig. 3.—*Labia rehni* n. sp. Dorso-caudal outline of pygidium. Type, ♀. (Greatly enlarged.)
Fig. 4.—*Prolabia pulchella* (Serville). Dorso-caudal outline of male pygidium. Thomasville, Georgia. (Greatly enlarged.)
Fig. 5.—*Prolabia unidentata* (Beauvois). Dorso-caudal outline of male pygidium. San Francisco Mountains, San Domingo. (Greatly enlarged.)

face deplanate in proximal half, thence feebly convex; ventral surface deplanate; proximad the shaft is excavate to accommodate the pygidium, thence the internal face is deplanate for two-fifths the distance to apex, with ventral margin cingulate, feebly concave and microscopically closely and bluntly serrulate; beyond this point this margin is feebly lamellate from the juncture of the dorsal and ventral surfaces and is supplied with well-spaced, microscopic serrulations. Caudal margin of penultimate ventral abdominal segment transverse, very feebly convex. Limbs as in *minor*: short; thickly supplied with minute hairs; femora stout; metatarsus with ventral surface hairy, with two rows of chaetiform spines.

[5] In *minor* the eye is only very slightly shorter than the cheek.

[6] In *minor* nearly twice as long as pronotum.

[7] In *minor* the wings project beyond the tegmina fully the pronotal length.

Length of body, 4.5; of pronotum, .86; of tegmen, 1.16; of exposed portion of wing, .41; of forceps, 1.36; width of pronotum, .88; of abdomen, 1.6 mm.

Head and pronotum bister. Tegmina and wings snuff brown. Dorsal surface of abdomen auburn, shading to blackish brown laterocephalad. Forceps auburn. Antennae, limbs and underparts buckthorn brown.

The type is unique.

8. **Labia curvicauda** (Motschulsky).

1863. *Forficelisa curvicauda* Motschulsky, Bull. Soc. Nat. Moscou, XXXVI, p. 2, pl. II, fig. 1. [Nura-Ellia Mountains, Ceylon.]

1912. *Labia curvicauda* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 237. [Long Key, Florida.] (First United States record.]

The species is known from the United States only from the large series taken at Long Key, Florida, in the dying tops of cocoanut palms, at the white bases of the petioles where these were moist.

9. **Prolabia pulchella** (Serville).

1839. *Forficula pulchella* Serville, Hist. Nat. Ins., Orth., p. 42. [Niagara, New York[3].]

1876. *Labia guttata* Scudder, Proc. Bost. Soc. Nat. Hist., XVIII, p. 265. [Texas.]

1876. *Labia burgessi* Scudder, ibid., p. 266. [Palatka, Florida.]

1876. *Labia melancholica* Scudder, ibid., p. 267. [Waco, Texas.]

1900. *Labia pulchella* Bormans, Das Tierreich, p. 65. [Texas.]

1911. *Labia unidentata* Burr, (in part, not of Beauvois, 1917), Proc. U. S. Nat. Mus., XXXVIII, p. 451. [Florida; Thomasville, Georgia; Texas.]

1911. *Prolabia unidentata* Burr, (in part, not of Beauvois, 1917), Gen. Ins., Fasc. 122, Dermapt., p. 57. [United States.] (Generic assignment.)

Careful comparison of all the material before us of the Unidentata Group, proves conclusively the above synonymy, as has been indicated by Burr. Contrary to that author's opinion, however, the species found in the United States is distinct from the West Indian *Prolabia unidentata* (Beauvois).

In *pulchella*, the male pygidium is distinctive in being roughly subquadrate, with broad distal margin subtruncate.

[3]One specimen, collected by Schaum, bore no data: the other was labelled "Niagara"; clearly mislabelled or an adventive specimen.

Alabama: Greenville, VIII, 3, 1915, (M. Hebard; under bark of dead sweet gum), 1♀, [Hebard Cln.]; Evergreen, VIII, 3, 1915, (M. Hebard; under bark), 2♂, 4♀, [Hebard Cln.].

Louisiana: Nairn, XI, 1892, (H. E. Weed), 1♀[9], [A. N. S. P.]; Arcadia, VIII, 20, 1915, (Rehn & Hebard; few under bark of dead birch, where *Vostox brunneipennis* was abundant), 2♂, 5♀[10]. [Hebard Cln. and A. N. S. P.].

This insect is common under the dead bark of trees in the southeastern United States, but particularly of dead pines of various species. Among deciduous trees it has been found under the bark of Sweet Gum, Oak, Magnolia and Birch. The winged condition has been much more frequently found under bark of deciduous trees, but this is not a rule.

The species is widely distributed over the southeastern United States, but has not as yet been secured on the Florida Keys. Its northern boundary on the Atlantic coast is the Fall line. The most northern records are Raleigh, North Carolina; Vienna, Georgia; Montgomery, Alabama, and Arcadia, Louisiana. The northwestern limits are Waco and Bosque County, Texas.

10. **Prolabia arachidis** Yersin.

1860. *Forficula arachidis* Yersin, Ann. Soc. Ent. France. (3), VIII, p. 509, pl. X, figs. 33 to 35. [[Adventive at] Marseilles, France.]

1900. *Labia burgessi* Henshaw, (not of Scudder, 1876), Psyche, IX, p. 119. [[Adventive at] Boston, Massachusetts.] (First United States adventive material.)

1911. *Labia arachidis* Burr, Proc. U. S. Nat. Mus., XXXVIII, p. 453. [From ship at San Francisco from India.]

1913. *Prolabia arachidis* Caudell, Proc. U. S. Nat. Mus., XLIV, p. 598. [Adventive at San Francisco, California, and Brighton, Massachusetts; Aiken, Florida.] (First United States established record.)

Texas: Brownsville, VI, (H. F. Wickham), 1♂, [Hebard Cln.].

The present domiciliary insect is known from the United States only from the above record and references, excepting the series taken by Rehn and Hebard, at Homestead, Florida.

[9] This specimen is very pale in general coloration.

[10] All these, and the Greenville specimen, have fully developed wings. In the series from Georgia and Florida, this condition is very rare; represented in but 6, of 271 specimens examined.

CHELISOCHINAE.

11. **Chelisoches morio** (Fabricius).

1775. *F[orficula] morio* Fabricius, Syst. Ent., p. 270. [Tahiti.]

1907. *Chelisoches morio* Caudell, Jour. N. Y. Ent. Soc., XV, p. 169. [Menlo Park, California.] (First United States record.)

California: Alameda County, (R. Hunt; on bananas from Hawaii), 1 ♂, [Hebard Cln.].

Though the specimen here recorded is adventive, the species has become established at Menlo Park, California. It is widely distributed through the Papuan and Indo-Malaysian regions.

FORFICULIDAE.

FORFICULINAE.

12. **Doru lineare** (Eschscholtz).

1827. *Forficula linearis* Eschscholtz, Entomogr., p. 81. [Santa Catharina, Brazil.]

1865. *F[orficula] californica* Dohrn, Stett. Ent. Zeit., XXVI, p. 85. [California.] (First United States record.)

1876. *Forficula taeniata* Scudder, Bull. U. S. Geol. Geogr. Surv. Terr., II, p. 255. [Exotic localities; Arizona; Texas.]

1876. *Forficula exilis* Scudder, Proc. Bost. Soc. Nat. Hist., XVIII, p. 262. [Texas.]

1900. All these specific names referred to *Apterygida* by Bormans, Das Tierreich, II, pp. 110 and 111.

1911. *Doru exile* Burr, Gen. Ins., Fasc. 122, Dermapt., p. 79. [Exotic; southern United States.]

1911. *Doru lineare* Burr, (in part), ibid., p. 79. [Exotic; Southern United States.]

1914. *Doru lineare* Rehn and Hebard, Jour. N. Y. Ent. Soc., XXII, p. 90, figs. 1 to 4. (Synonymy; general diagnosis; records.)

Arizona: San Xavier, Pima County, VII, 24, 1916, (Lutz & Rehn; attracted to light). 1 ♂, [A. M. N. H.]; Palo Alto Rancho, Altar Valley, about 3000 feet, X, 10, 1910, (M. Hebard; moderate numbers in bunches of coarse green grass, in meadow near wash), 8 ♂, 3 ♀, [Hebard Cln. and A. N. S. P.]; Sycamore Cañon, Baboquivari Mountains, about 3700 feet, X, 6, 1910, (Rehn and Hebard; attracted to light), 1 ♀, [Hebard Cln. and A. N. S. P.].

The insect is usually found in rank grasses. It frequently appears at night at light.

In the United States, the species is known only from about Brownsville, Texas, generally over the Tucson region in

Arizona and from southern California. It is widely distributed southward over the American continent as far as the Misiones, Argentina. In the West Indies it is known only from Cuba.

13. **Doru aculeatum** (Scudder).

1862. *Forficula aculeata* Scudder, Proc. Bost. Soc. Nat. Hist., XVIII, p. 262. (In part.) [New York: northern Illinois; southern Michigan.[11]]

1900. *Apterygida luteipennis* Bormans, (in part not *Forficula luteipennis* Serville, 1839), Das Tierreich, II, p. 118. [New York.]

1910. *Doru lineare* Burr, (in part not *Forficula linearis* Eschscholtz, 1827), Proc. U. S. Nat. Mus., XXXVIII, p. 464. (Name assignment without material at hand.)

1914. *Doru aculeatum* Rehn and Hebard, Jour. N. Y. Ent. Soc., XXII, p. 93, figs. 5 and 7. (General diagnosis, measurements, records.)

Alabama: Mobile, VIII, 27, 1915, (Rehn & Hebard; moderately common in cane, high weeds and cat-tails in swamp on edge of Mobile Bay), 2 ♂, 12 ♀, 8 juv., [Hebard Cln. and A. N. S. P.].

Louisiana: Harahan, Jefferson Parish, VIII, 7, 1915, (Rehn & Hebard; beaten from high grasses beside road), 1 ♀, [Hebard Cln.]; Morgan City, La., VIII, 8, 1915, (Rehn and Hebard; beaten from grasses and plants in swamp), 3 ♀, (wings fully developed) [Hebard Cln. and A. N. S. P.]

The specimens from Morgan City are the first of a macropterous condition to be found in the present species.

This insect is usually found in high grasses. It is difficult to locate.

The distribution of this species covers the Mississippi Valley, not extending west of the line of semi-aridity. It is known northwestward to eastern Nebraska, northward to southern Michigan, New York and Snake Hill, New Jersey. Though apparently common in the southern Appalachians, it apparently does not occur southeastward of that region. We believe the species will be found on the Gulf coast from western Florida to eastern Texas.

14. **Doru davisi** Rehn and Hebard.

1914. *Doru davisi* Rehn and Hebard, Jour. N. Y. Ent. Soc., XXII, p. 95, figs. 6 and 8. [South Bay, Lake Okeechobee, Florida.]

[11] The specimen recorded from Cuba, with a query, represents *Doru lineare*.

This striking species is still known only from the series originally studied, taken on the lake shore on low tangled vegetation between the water and a thick growth of Custard-apple trees.

15. **Forficula auricularia** Linnaeus.

1758. *F[orficula]auricularia* Linnaeus, Syst. Nat., Ed. X, I, p. 423 [Europe.]

1853. *Forficula auricularia* Fieber, Lotos, III, p. 254. [Exotic record; America.] (First American record.)

Rhode Island: Kingston, XII, 6, 1912, (A. E. Steene), 1 ♂, 1 ♀, [U. S. N. M.]; Newport, late VI, 1914, (R. W. Glaser), 5 juv., [A. N. S. P. and Hebard Cln.].

This insect has been previously reported from the United States from adventive material. It has recently become permanently established in New England, the species appearing in great numbers out of doors at Newport, Rhode Island.

In addition to the species considered above, a specimen of *Spandex percheron* (Guerin and Percheron), adventive in Massachusetts, was first described as *Spongophora bipunctata* by Scudder, then recorded as *Forficula percheroni* by Scudder and later as *Psalis percheroni* by Caudell.

Some North American Anthomyiidae (Dipt.).

By O. A. Johannsen, Cornell University, Ithaca, New York.

Since the appearance of my paper on New Eastern Anthomyiidae* I have noted several novelties, among them the male of *Dialyta flavitibia* which was kindly sent to me by Mr. C. W. Johnson. The discovery of the male of this species confirms my generic determination. I have also found the male of the *Hylephila*,† mentioned in my previous paper, which enables me to give a description of the species.

Hammomyia paludis n. sp.

♂.—Length 5-6 mm. Head black, silvery gray pruinose with black reflections; in profile the genae are about 0.4, the buccae about 0.6, the

*Trans. Amer. Ent. Soc., XLII: 385.

†*Hylephila* appears to be preoccupied in Lepidoptera. The genus may be merged with *Hammomyia* as has already been done by Stein.

width of one eye; about 8 setae on each side of the front; four or five incurved setae below vibrissae, setae on the lower part of the buccae long and fine, though sparse. Face concave in profile, oral margin distinct; antennae black, third segment nearly twice as long as the second, not reaching the oral margin by a distance of over half the length of this segment; arista noticeably thickened at the base, short pubescent to the tip. Frontal stripe dull black, at the narrowest point but little broader than the diameter of the anterior ocellus; orbits gray pruinose, each at the narrowest point over half as wide as the frontal stripe in the same section; proboscis and palpi fuscous.

Thorax black, brownish gray pruinose, with three black vittae, the laterals on line with the dorso-central setae. Inner d. c. (acrostichals) small, in two rows; d. c. 2+3; st. 1+2, long; "pra" fine, about a third as long as the following seta. Scutellum with a pair of strong basals, strong subapicals, small apicals, slender discals, besides some finer discal hairs; pubescence of the lower surface restricted to a few fine pale hairs.

Abdomen gray pruinose, each segment more fuscous at the base and with a median fuscous line narrowing at the posterior margin. The abdomen is more or less cylindrical, wedge-shaped posteriorly, each segment with long slender setulae both dorsally and ventrally, dorsal marginal setae distinctly stronger than the discal setulae; fifth sternite with a wide and deep triangular notch similar to that figured by Schnabl and Dziedzicki for *H. janowskii* (Pl. 26, fig. 691). The hypopygium closely resembles that of *H. unilineata* as figured by these authors on plate 5, figs. 79, 80.

Legs black, gray pruinose; femora with long fine setae, strongest on the lateral surfaces of the hind pair; fore tibiae each with two outer lateral extensor setae; middle tibiae each with five, one of which is on the basal third on the posterior extensor side, the others, nearly on a level beyond the middle, one anterior, one posterior, one outer, and one inner seta; hind tibiae each with two or more outer lateral flexor, four large outer extensor, three large posterior extensor, and five or more fine inner flexor, setae. Tarsal claws long, setulose at the base, about as long as the pulvilli.

Wings brownish gray hyaline, veins brown; costal spines small but distinct; veins R 4+5 and M 1+2 parallel or very slightly converging at the tip; extreme tip of R 4+5 slightly reflexed; R 1 ends opposite the r-m crossvein; m-cu crossvein slightly sinuous, perpendicular to Cu 1; penultimate section of M 1+2 is about two-thirds as long as the ultimate section. Squamae yellow-tinged, upper one covers the lower; halteres dark yellowish.

♀.—Like the male, except that the antennae are a little shorter; the lower posterior sterno-pleural seta is much shorter than the upper; "pra" about half as long as the following seta. Setulae of the abdomen

stout, but not as long as in the male. Apex of the ovipositor with the upcurved spines characteristic of the females of this genus. Hind tibiae lack the fine setae of the inner flexor surface. Last section of M 1+2 only about a fifth or a fourth shorter than the penultimate. The size is quite variable, ranging from 4 to 7 mm. in length.

Type (male) from Melrose Highlands, Massachusetts, in my collection. Paratypes from Melrose Highlands, Massachusetts, and Ithaca, New York, Melrose Highlands Laboratory and Cornell University collections. April and May.

Some specimens in Dr. J. M. Aldrich's collection from Lafayette, Indiana, differ only in having a much larger "pra," in having numerous setulae among the acrostichals, and more abundant and larger setulae upon thorax and abdomen. This species differs from *H. maculata* St., in the chaetotaxy of the legs and in the structure of the hypopygium of the male; from *H. unilineata* it differs in having narrower genae, in the form of the fifth sternite and in size. *H. maculata* has not yet been taken in New York; my previous reference to it should be applied to *H. paludis*.

PROSALPIA.

This genus resembles *Hammomyia* and *Hylephila* in having an elongate anal vein, a pilose lower surface of the scutellum, and narrow front in both sexes, but differs from the former in having a bare or pubescent arista and from both in not having the head inflated. The two species recorded from North America in Aldrich's catalogue may be distinguished as follows.

a. Thorax and abdomen shining black, without pruinosity. Female. *arcuata* Walker.

aa. Thorax brownish gray with darker vittae; opaque. *silvestris* Fall.

There is a female specimen in the Cornell University collection from Truro, Nova Scotia, of the second species which I cannot distinguish from my European specimen. Walker (List, IV) described three species from Canada, which Stein, with a slight doubt in each case, considers synonymous with *sylvestris*. A study of the descriptions reveals but trifling differences.

LISPOCEPHALA.

The species of this anomalous genus were formerly grouped with *Coenosia* to which they bear a striking resemblance in the arrangement of the sterno-pleural setae, setae of the posterior tibiae, wing venation, and in the spotted abdomen. The genus is now placed among the *Limnophorinae*. The front is broad in both sexes as in *Lispa,* and the fulcrum of the hypopygium of the male is directed forward. The species thus far known to occur in the United States may be separated as follows.

a. Crossvein not clouded.

b. Middle tibia with a bristle on the anterior side; costal spine present; wing with a brownish tinge. Ohio, New Hampshire, *verna* Fabr.

bb. Middle tibia with no seta on the anterior side; costal spine not distinct.

c. Wing of the male milky white. Many localities in the United States....*erythrocera* R. D. (= *lacteipennis* Zett. IV, 1722).

cc. Wing of the male grayish hyaline. Massachusetts, var. of *erythrocera ?*

aa. Crossveins clouded; middle tibia with no seta on the anterior side. Orono, Maine.....*alma* Meigen, var. *pallipalpis* Zett. (b).

There is another *lacteipennis* Zett. (IV. 1586), a species not yet recorded from the United States, which should not be confused with *L. erythrocera* (= *lacteipennis* Zett., IV. 1722). The former species is now placed in *Dexiopsis,* a Coenosine genus. Specimens of *L. alma* were taken at Orono, Maine, in October. I have referred these specimens to var. *pallipalpis* Zett. (b) because the abdomen is but faintly translucent at the base and at the apical margins of the first and second segments.

Limnophora torreyae Joh.

In the original description of this species a misprint occurs. The post sutural d.c. setae are four and not three in number. In some specimens the orbits are not quite contiguous, being separated by a slender frontal line.

Mydaea pectinata Joh.

In the original description of this species, fourth line from the top, page 393, substitute for the words "tibia with a row" the words "tibia with an irregular double row."

Phaonia nigricans Joh.

The genus *Phaonia,* as at present defined by recent European workers, is distinguished from *Mydaea* by the presence of a seta on the posterior median extensor surface. If this interpretation be adopted the specific name noted above which I assigned to one of our New York species need cause no confusion. If, however, the emphasis be placed upon the presence or absence of the pilosity of the eyes, redistributing the species into the two groups corresponding to the genera *Hyetodesia* and *Spilogaster,* then the name *nigricans* becomes a homonym, having been assigned to another species by Stein in 1897. For the benefit of those who prefer the latter grouping of species I suggest that the name **cayugae** be adopted to replace my *nigricans.*

An additional locality record for this species is McLean, Tompkins County, New York.

Dialyta flavitibia Joh.

♂.—Like the female except that it is a trifle smaller (6 mm.); the front is about as wide as one eye, somewhat narrowing at the base of the antennae; buccae narrower and antennae longer and broader than in the female; orbits about half as wide as the frontal stripe at the lower ocellus. Abdominal setae longer and stouter than in the female; five pairs of marginal setae on each of segments two and three and six pairs on the fourth, five pairs of discals on the third and fourth segments; all sternites visible. Femoral setae stronger and more numerous; tibial setae as in the female except that those of the hind legs on the outer lateral flexor side are more uniform in size. Crossveins only faintly tinged; one large costal spine; R 4+5 more arched upward. The hypopygium somewhat resembles that of *D. atriceps* as figured by Schnabl and Dziedzicki (Pl. 21, figs. 555, 556). In our species, however, the fulcrum has, in addition to the laterals, a small median tubercle on the ventral side; the inferior forceps are stouter, and the superior forceps are quite different, being deeply cleft, resembling those shown in fig. 493 (Pl. 19), but with the median angles rounded, not produced. The fifth sternite differs but little from that figured for *D. atriceps.*

This specimen was taken at Danbury, Connecticut, in June, and sent to me by Mr. C. W. Johnson. There is a female specimen in the Cornell Collection from Ohio, and Mr. Johnson writes me that the species also occurs in Pennsylvania and Ontario.

New Species of Lepidoptera.

By Henry Skinner.

Argynnis californica n. sp.

♂. This species is paler in color than its related forms and has a faded or washed out appearance in comparison with its relatives. In size it is smaller than *snyderi* which it resembles in markings. It is about the same size as *calippe* Bd. and *juba* Bd. but is larger than *coronis* Behr. It can be at once separated from *calippe* by its much lighter color and from *juba* by the much duller color of the buff band on the underside of the secondaries. Both sexes are heavily silvered beneath.

♀. Quite similar to the male in color and markings.

The male expands 56 mm. and the female 58 mm.

Described from fifteen specimens from California, the type and paratypes were taken by Mr. J. G. Grundel at Alma, Santa Clara County.

I would not have ventured describing this species without a good figure if it had not been already well figured by Mr. W. H. Edwards under the name *coronis,* in his *Butterflies of North America,* vol. 3, pl. 4 of *Argynnis.* A number of years ago I compared specimens of my own with the type of *coronis* Behr in the Strecker collection. Due to Mr. Edwards' figure of this species it has been accepted as *coronis* and *snyderi,* a related species, has been considered by some persons a variety of *coronis.* The true *coronis* is very close to *juba* and *calippe.*

Melitaea arida n. sp.

Upperside. Primaries dull fulvous marked with a series of small spots crossing the wing from the costa to the interior margin. The submarginal row is almost obsolete, the central spot being a crescent; the next row consists of three larger spots beyond the cell and two below, the last one small and hour-glass in shape; the last row consists of one spot near the end of the discal cell and one spot directly below it.

Secondaries same color as primaries with three rows of spots crossing the wing from the costa to the interior margin. The submarginal row consists of seven, narrow, minute yellowish crescents; the next row is composed of six minute black spots edged on the inner side by dull yellow; the next row is a curved line of minute yellowish spots; there is a yellow linear spot in the cell.

Underside. The primaries have a marginal border composed of brown and yellowish spots; the limbal area is marked by spots of two shades of fulvous.

The secondaries have a submarginal row of crescents, two near the costa and one at the lower third; the next row consists of five small black dots, the lower one very minute; the basal area is made up of several rows of spots semi-silvered.

Expanse 26-30 mm.

Type and *paratype.* Two specimens marked Cochise Co.,

Arizona, May. Received from Mr. F. Haimbach without more definite locality.

This species is close to *vesta* Edw. but the markings are much fainter and different in color, those of *vesta* being orange-fulvous. The characteristic row of orange fulvous spots so conspicuous in *vesta* is replaced in *arida* by a faint line of spots. The silvered spots on the underside of the secondaries are also characteristic.

Erythroecia hebardi n. sp.

In volume nine of Sir George Hampson's Catalogue of the Lepidoptera Phalaenae, p. 57, there is erected the new genus *Erythroecia* with the type species *suavis* H. Edwards. He describes a new species under the name *rhodophora* which is figured on plate 138, no. 4. The type locality given is Capitillo, Guatemala.

Last summer Mr. Morgan Hebard captured a species of *Erythroecia* at Hot Springs, Virginia, August 15th, at light, two perfect male specimens.

This appears to be a much more robust species than *rhodophora* and the primaries are much more obscured by red (crimson) and the ground color of the wings is yellow, almost orange. The orbicular and reniform do not show as in Hampson's figure. The Virginia species expands 34 mm.

It is possible that this may be a very good species, a topomorph or only a variety of *rhodophora* but additional material is needed to establish their true relationship. If they are the same species the distribution as at present known appears very strange.

Autographa olivacea n. sp.

♂. Head and thorax gray mixed with white hairs; tegulae gray; thoracic crest gray-white at tips; abdomen and legs gray; crests brown tipped with gray. Fore wing grey tinged with whitish olive, the medial area below the cell shining dark olive, extending from the apex and covering the outer third of the wing and extending two-thirds the distance to the inner margin; orbicular faintly indicated and not silvered; a very small silver stigma, linear and having a faint incurved point at the outer end; hind wing with a greenish tinge.

Expanse 39 mm.

Type one specimen sent to me by Mr. Eugene O. Murmann, taken at Los Angeles, California, August, 1916.

This species resembles *ampla* Walk. but may be readily differentiated by the olive shade of the outer half of the primary wing.

The types of these species are in the collection of The Academy of Natural Sciences of Philadelphia.

ENTOMOLOGICAL NEWS.

PHILADELPHIA, PA., JULY, 1917.

Insects and War.

Unfortunately the lessons of the past have not been sufficiently taken to heart and at the present time we are confronted with the grim destroyer in many forms. Every soldier thinks he will be one of the fortunate individuals and escape some death-dealing missile, but he is much more likely to be the victim of some low and minute form of either animal or vegetable organism.

In spite of the great advance of modern science and knowledge gained, its practical application is relatively very defective and inefficient. The mind of the medical profession runs largely to therapeutics—the application of drugs to the cure of disease, but unfortunately remedial measures can't compare in value with preventive medicine. The sick soldier is a distinct loss as a fighting unit and is a menace and expense to the Government as he needs hospitals, doctors, nurses and medicines.

A few references to the past may enlighten the thoughtful. During the Civil War, on the Union side, 93,369 soldiers were killed and 186,216 died from disease. In the Crimean War 4,602 were killed and 17,580 died victims of disease. A remarkable example of mortality from disease and low death rate from wounds is shown by the figures from the French Expedition to Madagascar in 1894, 29 being killed and 7,000 dying from disease. In the Spanish-American War only 454 Americans were killed and 5,277 died from disease, mostly typhoid fever carried by house-flies. A more specific instance of disease morbidity and mortality is shown by what happened to the First Pennsylvania Infantry in 1898. There were 792 men in the regiment and 169 cases of typhoid fever and twelve deaths. In many of the camps in this country and Cuba men were compelled to walk through human excrement to get to the latrines, and the food in the mess tents was black with flies. The mouths of the sick soldiers in the hospitals and hospital

tents could not be seen for house-flies, and these insects were sucking the juices from the lips of unconscious soldiers and many of these sick men were brought to Philadelphia by the car-load.

Insects are responsible entirely or in large part for the transmission of typhoid fever, typhus fever, malaria, yellow fever and tuberculosis and many lesser forms of disease.

Strange to say, the persons most keenly alive to these conditions and the persons who are meeting and trying to prevent these things are the mothers of the young men being trained for war.

So far as we are aware the Government has done very little to prevent a recurrence of this dreadful sacrifice of life. There will be plenty of medical men to look after the small ills incident to camp life, but will the expert and capable men be there to guard against disease? It has been suggested that a medical entomologist should be stationed at each concentration camp, a most important matter, as sanitation and preventive measures greatly exceed drug therapeutics in importance. We sincerely hope that the present war will not show the dreadful mortality from disease exhibited in the wars of the past.—HENRY SKINNER.

The second report of the Emergency Entomological Service of the United States Department of Agriculture, to which we called attention in the NEWS for June, page 283, has appeared, dated June 1, 1917, in 19 mimeographed pages. It announces the establishment, as an emergency measure, of a distinct section or branch of the Bureau of Entomology, that of "Stored Product Insect Investigations," of which Dr. E. A. Back has been put in charge. Plans for the use of the Boy Scout organization to report insect injuries and to spray infested small gardens are being developed. There are reports of insect injuries as in the first report; 3½ pages are devoted to a consideration of the "acute situation [which] appears to exist as to the supply of arsenical insecticides in this country." It is stated that "The Council of National Defense is still considering the plans for the utilization of entomologists in the war. The present plan of the Council provides for a corps of entomologists to be coordinate with the corps of sanitarians. This subject is also being considered by the Chief of Bureau and the Surgeon General of the Army Medical Corps."

Entomological Literature.

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded.

The numbers in **Heavy-Faced Type** refer to the journals, as numbered in the following list, in which the papers are published.

All continued papers, with few exceptions, are recorded only at their first installments.

The records of papers containing new species are all grouped at the end of each Order of which they treat. Unless mentioned in the title, the number of the new species occurring north of Mexico is given at end of title, within brackets.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

3—The American Naturalist. **4**—The Canadian Entomologist. **5**—Psyche. **11**—Annals and Magazine of Natural History, London. **37**—Le Naturaliste Canadien, Quebec. **50**—Proceedings, U. S. National Museum. **102**—Proceedings, Entomological Society of Washington. **141**—Proceedings, Indiana Academy of Sciences, Indianapolis. **143**—Ohio Journal of Science, Columbus, Ohio. **153**—Bulletin, American Museum of Natural History, New York. **161**—Proceedings, Biological Society of Washington. **184**—Journal of Experimental Zoology, Philadelphia. **195**—Bulletin, Museum of Comparative Zoology, Cambridge. **198**—Biological Bulletin, Marine Biological Laboratory, Woods Hole, Mass. **238**—Annales, Sociedad Cientifica Argentina, Buenos Aires. **263**—Proceedings of the Hawaiian Entomological Society, Honolulu. **335**—Smithsonian Miscellaneous Collections. **373**—Contributions to the Natural History of the Lepidoptera of North America, by Wm. Barnes and J. H. McDunnough, Decatur, Ill. **392**—The Irish Naturalist, Dublin. **411**—Bulletin, The Brooklyn Entomological Society. **420**—Insecutor Inscitiae Menstruus: A monthly journal of entomology, Washington. **537**—Proceedings, Entomological Society of Nova Scotia, Truro. **538**—Lorquinia, Los Angeles. **540**—The Lepidopterist, Official Bulletin, Boston Entomological Club. **547**—Journal, The Franklin Institute, Philadelphia.

GENERAL SUBJECT. Banks, N.—Index to the literature of American economic entomology, Jan. 1, 1905, to Dec. 31, 1914 (323 pp.). [Pub. Am. Assoc. Ec. Ent., Melrose Highlands, Mass.]. **Berlese, A.**—Gli insetti loro organizzazione, sviluppo, abitudini e rapporti coll'uomo (II, fasc. 13-16). **Bethune, C. J. S.**—The insect collections of Canada. I. The collections of the entomological society of Ontario, **4**, 1917, 153-7. **Cockerell, T. D. A.**—Sunflower insects in Virginia and Connecticut, **4**, 1917, 212. Descriptions of fossil insects [2 new], **161**, xxx, 79-82. **Dahlgren, U.**—The pro-

duction of light by animals. III. Worms, crustaceans and lower insects (99 pp. reprint), **547,** May-Jan., 1916-17. **DeWolfe, L. A.**—How to collect and preserve insects, **537,** 1916, 12-15. **Howard, Schwarz & Busck**—A biographical and bibliographical sketch of Otto Heidemann, **102,** xviii, 203-5. **McIndoo, N. E.**—Recognition among insects, **335,** lxviii, No. 2, 78 pp. **Pierce, W. D.**—Notes on a southern trip, **102,** xviii, 206-7. **Provancher**—Biographical note by C. V. A. Huard, **37,** xliii, 145-52. **Slosson, A. T.**—Experiences of a collector, **411,** xii, 25-9.

PHYSIOLOGY AND EMBRYOLOGY. Foot & Strobell—Results of crossing Euschistus variolaris and E. ictericus with reference to the inheritance of two exclusively male characters, **198,** xxxii, 322-42. **Hyde, R. R.**—On the change that takes place in the chromosomes in mutating stocks, **141,** 1915, 339-44. **Jennings, H. S.**—Modifying factors and multiple alleomorphs in relation to the results of selection, **3,** li, 301-6. **Macdowell, E. C.**—Bristle inheritance in Drosophila, **184,** xxiii, 109-146. **Painter, T. S.**—A wing mutation in Piophila casei, **3,** li, 306-8. **Patterson, J. T.**—Studies on the biology of Paracopidosomopsis, **198,** xxxii, 291-305.

NEUROPTERA, ETC. **Hood, J. D.**—An annotated list of the Thysanoptera of Plummer's Island, Md., **420,** v, 53-65. **Howe, R. H.**—Distributional notes on New England Odonata, **5,** xxiv, 45-53. **Walker, E. M.**—Seasonal irregularities in the occurrence of dragonflies, **4,** 1917, 171-8.

Kennedy, C. H.—Notes on the life history and ecology of the dragonflies of central California and Nevada [several n. gen. and sps.], **50,** lii, 483-635.

ORTHOPTERA. **Caudell, A. N.**—Color dimorphism in Schistocerca damnifica; The habitat of Doru aculeatum, **102,** xviii, 216-17. **Crampton, G. C.**—A comparison of the antennae of the Grylloblattidae and Embiidae to demonstrate the relationship of these two groups of insects, **4,** 1917, 213-17. **Gooderham, C. B.**—The Acrididae of Nova Scotia, **537,** 1916, 21-30. **Illingworth, J. F.**—Regeneration in cockroaches, **263,** iii, 266.

HEMIPTERA. **Drake, C. J.**—New and noteworthy Tingidae from the United States [3 new], **143,** xvii, 213-16. **Gibson, E. H.**—Three n. sps. of Jassoidea from Missouri; Two n. sps. of Dicyphus from Porto Rico, **4,** 1917, 183-4; 218-19. **Gillette, C. P.**—Two new aphid genera and some new species, **4,** 1917, 193-98. **Heidemann, O.**—Two n. sps. of lace-bugs, **102,** xviii, 217-9.

LEPIDOPTERA. **Brethes, J.**—Estudio fito-zoologico sobre algunos lepidopteros argentinos productores de agallas, **238,** lxxxii, 113-40. **Dyar, H. G.**—Seven new Pyralids from British Guiana,

420, v, 88-92. **Forbes, W. T. M.**—Notes on West Indian Syntomidae and Arctiidae, **153**, xxxvii, 339-45. **Hampton, G. F.**—Descriptions of new Pyralidae of the subfamilies Hydrocampinae, Scopariinae, etc., **11**, xix, 361-76 (cont.). **Marchand, W.**—The specific differences between Apantesis nais, A. vittata and A. phalerata, **5**, xxiv, 59-60. **May, R. M.**—The life history of a swallowtail butterfly (Papilio zolicaon), **538**, i, 77-9.

Barnes & McDunnough—A revision of the genus Hydriomena [8 new], **373**, iv, 1-59. **Dyar, H. G.**—Miscellaneous new American L. [8 new]; Notes on No. Am. Pyraustinae [6 new]; Notes on No. Am. Nymphulinae [7 new]; Notes on No. Am. Schoenobiinae [10 new]; Seven new Crambids from the United States, **420**, v, 65-87. **Pearsall, R. F.**—Synchlora avidaria n. sp., **411**, xii, 34-5. **Swett, L. W.**—New Geometrids [2 new], **540**, i, 45-8.

DIPTERA. Elwyn, A.—Effect of humidity on pupal duration and on pupal mortality of Drosophila ampelophila, **153**, xxxvii, 347-53. **Gibson, A.**—The occurrence of Eumerus strigatus in Canada, **4**, 1917, 190-1. **Ludlow, C. S.**—Cycloleppteron [new localities for], **5**, xxiv, 53. **Snyder, T. E.**—Notes on horseflies as a pest in southern Florida, **102**, xviii, 208-10.

Alexander, C. P.—New nearctic crane flies, III. [11 new], **4**, 1917, 199-211. **Hine, J. S.**—Descriptions of North American Tabanidae [5 new], **143**, xvii, 269-71. **Malloch, J. R.**—A key to the No. American genera of Coenosiinae [1 new g., 1 n. sp.]; A new gen. and sp. of Anthomyiidae, **411**, xii, 35-7; 37-8. **Parker, R. R.**—A new Sarcophaga from New York, **4**, 1917, 157-61. **Smith, H. E.**—Notes on New England Tachinidae, with the description of one n. gen. and two n. sps., **5**, xxiv, 54-8. **Van Duzee, M. C.**—Descriptions of a few new Diaphorus from the western states [7 new], **5**, xxiv, 33.

COLEOPTERA. Chapin, E. A.—Miscellaneous notes on C., **411**, xii, 29-31. **Schaeffer, C.**—Notes on a few Eucnemidae and descriptions of new Elateridae [5 new], **411**, xii, 39-44. **Schwarz, E. A.**—Rhizobius not Rhyzobius, **102**, xviii, 214.

Fall, H. C.—New Coleoptera.—VI. [9 new], **4**, 1917, 163-71. **Fisher, W. S.**—A new sp. of Xylotrechus, **102**, xviii, 214-16.

HYMENOPTERA. Chapais, J. C.—Quelques notes sur le "ver limace du poirier," **37**, xliii, 153-6. **Scharff, R. F.**—Should wasps be killed? **392**, 1917, 88. **Schwarz, E. A.**—Ants protecting acacia trees in Central America, **102**, xviii, 211-12. **Stohr, L. M.**—An interesting case of instinct, **4**, 1917, 161-3. **Turner, R. E.**—Notes on fossorial H. On new species in the British Museum, **11**, xix, 317-26.

Banks, N.—New fossorial H. [28 new], **195**, lxi, 97-115. **Felt, E. P.**—Two new sawflies, **4**, 1917, 191-2. **Gahan, A. B.**—Descriptions of some new parasitic H. [2 n. g.; 26 n. sps.], **50**, liii, 195-217. **Girault, A. A.**—The North American species of Habrocytus [6 new], **4**, 1917, 178-82. **Myers, P. R.**—An American species of the hymenopterous genus Wesmaelia, **50**, liii, 293-94. **Rohwer, S. A.**—A report on a collection of H. (mostly from California) made by W. M. Giffard [15 new], **50**, liii, 233-49. A nearctic species of Dolichurus; Diprion simile in No. America, **102**, xviii, 212-14.

OBITUARY NOTES.

[We have brought together, from various sources, published during the last year, the following data on entomologists who have recently passed away.]

A brief note in *Science* for February 2, 1911 (page 112) announced the death of Juan J. Rodriguez, of Guatemala City, on December 22, 1916. Thanks to Mr. William Schaus, we have received a typewritten copy of an obituary notice in *El Diario de Centro-América* (Guatemala), for December 22, 1916, from which we translate the following:

Don Juan J. Rodriguez Luna, who was born in 1840 and who consequently died at the advanced age of 76 years, had shown already in his early youth his love for this class of studies [zoology] and his competence in dealing with them. As was the custom in that period, he began his education in the College of the Seminary and has left us interesting notes of the awakening of his scientific inclinations. In the Seminary there existed no provision for the natural sciences, but he already observed with attention the life of insects, their metamorphoses and habits, and toward the end of his stay in the college, Father Parias, to stimulate his inclinations, lent him a very elementary book from the library. Another Father, notwithstanding, counselled him not to devote much time to this occupation because "he who looks much at the earth does not look to heaven." This did not hinder the young lover of nature from continuing his studies, which must have been well advanced in 1864, when the Sociedad Economica de Amigos de Guatemala, founding the National Museum in that year, confided to him the zoological section.

In 1867 he was admitted as an advocate, a profession which he never practiced, and his father, don José Mariano Rodriguez, arranged that he should undertake a voyage to Europe. So the son made his first visit to the Old World in 1868. In Paris and especially in Belgium he cultivated the friendship of men of science working in zoology and chiefly in entomology and, with a great fund of new information, returned to Guatemala in 1869. The museum of the Economic

Society gained much by this voyage and in 1874 already possessed 786 specimens of birds alone, of 455 different species, all from Guatemala, exactly classified by Señor Rodriguez.

In 1878 and 1887 Señor Rodriguez Luna made two more voyages to Europe and in both obtained many things useful for his country and for the sciences of his specialty.

One of the benefits which Guatemala owes to him is the introduction of species new to the country. He introduced tubers and seeds of plants which today are abundant in our gardens; in 1865 he propagated *Eucalyptus globulus*, the first seeds of which were sent him by the distinguished Belgian naturalist, Dr. Candèze; in 1878 he sent home from Belgium various plants of Liberian coffee, subsequently acclimated, and propagated here the two existing species of *Bougainvillea* and various fruits and flowers. A distinguished agriculturist, he cultivated sugar-cane and coffee, improving both by careful and intelligent selection. He exported quinine on a large scale and many other native products. For this reason, at the International Exposition at Paris in 1900, he obtained the greatest number of prizes awarded to any single agriculturist and received the cross of Chevalier of the Legion of Honor.

A great quantity and variety of scientific, historical and literary work flowed from his pen, which were published in the periodicals and reviews of Central America and of Europe during fifty years, so that he became a member of the Zoological and Acclimatization Societies of France, the Entomological and Malacological Societies of Belgium, the Society of Sciences of Liége, the Aragonese Society of Natural Sciences, etc.

He was Minister of Fomento [Promotion of Industry, etc.] and an important member of the commissions of all of our national expositions.

It is due to his country, and at the same time to honor its distinguished son, to preserve and employ usefully the results of his long and laborious life. To no one more than to the Nation belongs the right of acquiring the zoological mus-

eum and library of the learned naturalist, the best of its kind which exists in Guatemala.

An obituary notice of Señor Rodriguez is also to be found in *The Entomologist's Monthly Magazine* (London) for March, 1917, written by Mr. G. C. Champion, who contributes some additional items based on personal acquaintance. The indebtedness of the *Biologia Centrali-Americana* to Rodriguez for Coleoptera and incidentally other insects is acknowledged in the Introductory Volume of that work (page 44). De Selys received from him the types of *Anisagrion allopterum* (Odonata) and Candèze many Elateridae.

The Entomologist's Monthly Magazine for March, 1917, contains also obituary notices of Charles Owen Waterhouse, born at Bloomsbury, London, June 19, 1843, died at Acton, February 4, 1917, and of J. Platt Barrett, born near Marsden, Huddersfield, England, June 29, 1838, died December 27, 1916.

Waterhouse's father, G. R. Waterhouse, once keeper of Geology in the British Museum, and his brothers, E. A. and F. Waterhouse, all had entomological interests. C. O. Waterhouse was an Assistant and Keeper in the Entomological Department of the British Museum from 1866 to 1910, and was chiefly interested in the Coleoptera and Hymenoptera, his main work being on the Buprestidae in the *Biologia Centrali-Americana*. His *Aid to the Identification of Insects,* two volumes of colored plates, is well known. He was President of the Entomological Society of London, 1907-08.

J. P. Barrett was for fifty-three years an instructor in institutions for the deaf and dumb. His interests were mainly in the Macrolepidoptera of Britain and of Sicily and he was one of the founders of the South London Entomological and Natural History Society.

Charles Adolphus Briggs, known for his work on British Lepidoptera, Neuroptera (sensu Linnaei) and Orthoptera, born May 26, 1849, died October 17, 1916. (Entom., January, 1917).

Arthur E. Gibbs, who had in recent years "made a considerable collection of American Rhopalocera and for some time past mainly occupied himself with the study of these insects," died March 3, 1917, aged 58. He was a proprietor of the *Herts Advertiser* and the *St. Albans Times* (England). (Ent. Mo. Mag., April, 1917).

Dr. E. Bergroth contributes a brief note on Dr. Bertil Robert Poppius, the Finnish entomologist, who died at Copenhagen, November 27, 1916, aged 40 years. His most important works are *Monograph of the holarctic subgenus Cryobius (Carabidae)* and *Monograph of the Ethiopian Capsidae* (2 vols., 1912-1914). (Ent. Mo. Mag., Jan., 1917).

Roland Trimen, the distinguished author of *South African Butterflies,* died as long ago as July 25, 1916, and his decease should have received mention in an earlier number of the News. He was born at Paddington, London, October 29, 1840. He spent the years 1860-1895 in South Africa, first in the civil service, then from 1873 as curator of the South African Museum at Cape Town. His most important scientific work was *On some remarkable Mimetic Analogies among African Butterflies* (Trans. Linn. Soc. Lond. xxvi, 1869), dealing with the females of *Papilio merope (dardanus)*. He was President of the Entomological Society of London in 1897 and 1898, his addresses on Mimicry and on Seasonal Variation "being of special interest and value. In 1883 he was elected a Fellow of the Royal Society and received in 1910 the high distinction of the Darwin medal." (Ent. Mo. Mag., Sept., 1916, Entom., Oct., 1916).

Orson Bennett Johnson, professor emeritus of Zoology in the University of Washington, died March 9, 1917, aged 69, according to a note in *Science* for April 13 last. We have previously mentioned (this volume, page 41) his gift of his entomological collection to his University. A quarter of a century ago we received Odonata from Seattle from him and others also are indebted to him for material.

EXCHANGES.

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

☞ These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

For Exchange—Duplicate Rhopalocera from Japan and Formosa; Desiderata: butterflies of the world. S. Satake, No. 48 Aoyama-minamimachi 5-chome, Akasakaku, Tokyo, Japan.

Collecting Orders for any group of Insects or other animals desired.—C. H. Lankester, Cartago, Costa Rica, Central America.

Wanted—Diurnal Lepidoptera of the World. I can offer in exchange a large list of species, particularly southwestern forms.—Dr. John A. Comstock (Curator, Div. of Ent., Southwest Museum), 1275 Bellevue Avenue, Los Angeles, California.

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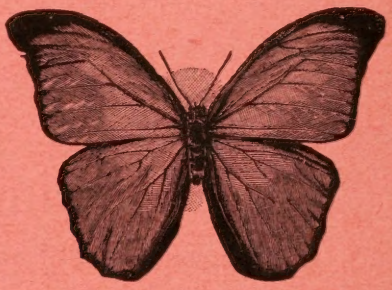

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